Evaluation of the On-Farm Water Management Project in the Dominican Republic

DESFIL

Development Strategies for Fragile Lands

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Tropical Research and Development, Inc.

in association with:

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Evaluation of the On-Farm Water Management Project in the Dominican Republic

by

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FOREWORD

The Development Strategies for Fragile Lands (DESFIL) Project assists the Bureaus for Science and Technology and Latin America and the Caribbean of the U.S. Agency for International Development in their regional programs to arrest the degradation of natural resources while encouraging the increased production of food and fuel for income generation. Tasks of specific interest to DESFIL include the analysis of appropriate technologies for the management of fragile area resources and incentives to stimulate the use of those technologies, the development of institutional arrangements that promote and facilitate sustainable development, and the analysis of related policies. As a centrally funded project, DESFIL also furthers general Agency goals related to privatization, democratization, and empowerment of less fortunate sectors of developing country populations.

As experience in the Dominican Republic shows, irrigated agriculture may be associated with potential negative environmental impacts. Misuse of irrigation water can result in significant declines in the productivity of land and water resources through soil erosion, waterlogging, and salinization. Agricultural inputs may be indiscriminately applied, and can lead to build-up of resistant pest populations and toxic chemical residues and to runoff.

Although these problems may seem technical in nature, inappropriate institutional arrangements can lead to misallocation and misuse of resources, as surely as can inappropriate technologies. This report documents a fundamental change in the institutional arrangements for irrigation management in two large irrigation systems in the Dominican Republic. The Dominican public sector agency in charge of irrigation has turned over management responsibilities to local, democratically empowered associations of water users. Early results associated with the transfer of responsibility indicate (1) a reversal in negative environmental impacts — salinization, declines in land productivity, and loss of productive area — associated with waterlogging in part of the area; (2) an increase in the area under irrigation; and (3) a spreading of irrigation benefits more evenly to all water users, regardless of size or location within these systems. Larger Agency and Bureau goals and objectives were well served by the technical and institutional changes documented in this report.

Michael Hanrahan
Program Coordinator

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Staff affiliated with Utah State University in Logan and in the Dominican Republic gave us historic background and present-day understanding about the project.

OFWMP/INDRHI and junta staff facilitated our contacts in the Azua and Santiago irrigation systems and enthusiastically discussed their OFWMP involvement with us.

Lastly, we are indebted to the many farmers in Azua and Santiago with whom we talked and for whom the achievements of this project hold important promise.

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EXECUTIVE SUMMARY

The On-Farm Water Management Project (OFWMP), sponsored by the U.S. Agency for International Development, was implemented with the Instituto Nacional de Recursos Hidraulicos (INDRHI) of the Dominican Republic. The project sought to strengthen INDRHI capacity to plan for and to manage irrigation systems, to increase irrigated agricultural productivity, and to improve lands affected by waterlogging. The two project areas, Azua (YSURA) and Santiago (PRYN Contract I), total 14,400 hectares, and serve 6,000 farm families.

To accomplish project objectives, the OFWMP (1) made physical improvements to the two irrigation systems, (2) assisted in formation of local organizations to manage the irrigation systems, and (3) facilitated turnover — the transfer of responsibility for system operations and maintenance (O&M) from a public sector agency to private sector associations known locally as Juntas de Regantes. These three steps are linked. Major rehabilitation of facilities coupled with organization of farmers enabled turnover to succeed.

This evaluation report was prepared by a consulting team that:

- Determined project progress against objectives;
- Assessed the viability of water user organizations (WUOs) established in YSURA and PRYN Contract I, and made recommendations to strengthen these institutions; and
- Documented the turnover process and recommended ways to extend the turnover model to other irrigation systems in the country.

PHYSICAL IMPROVEMENTS TO THE IRRIGATION SYSTEMS

Findings

Before OFWMP, YSURA was one of the worst-functioning, chaotic irrigation systems in the country. Water deliveries were not timely or reliable, especially for tail-end farmers. In both YSURA and PRYN Contract I, OFWMP financed major rehabilitation or new construction. With certain important exceptions, the irrigation and drainage infrastructures are now complete. Timely and reliable water deliveries are now being made to most parcels in the irrigation system. For many tail-end farmers, this has meant elimination of water delivery constraints as the principal limitation to agricultural production. Approximately 300 hectares have been brought under irrigation for the first time. Achieving more widespread, orderly, and equitable water deliveries was a pivotal OFWMP accomplishment, and one that permitted user organizations to take hold.

OFWMP increased the area reliably served and decreased the total amount of water delivered to the YSURA system. The effects were (1) increased water use efficiency and (2) improved water table conditions in the lower portions of the system. The reduction in water deliveries to YSURA, together with drainage facility

improvements that directly benefit some 800 hectares in both systems, are estimated to have benefitted over 2,000 hectares previously waterlogged.

Recommendations

By September 1990, we anticipate that rehabilitation of the physical works will be completed for PRYN Contract I. However, in YSURA, the drainage networks for Lateral 6 and the lower parts of Lateral 1 are not expected to be finished by that date. The evaluation team recommends that:

- High priority be given to completion of the drainage facilities on Laterals 1 and 6; and
- Physical improvements in pilot irrigation and drainage areas be suspended. We believe that there is already an over-investment in facility improvements to pilot areas and that further work in pilot areas will have a negative impact on junta viability.

ESTABLISHMENT OF WATER USER ORGANIZATIONS

Findings

OFWMP has successfully organized local water user organizations (juntas) to manage the YSURA and PRYN Contract I irrigation systems. Junta membership includes large landholdings, small agrarian reform plots, and small private holdings. Junta representatives are democratically elected. Representatives have employed irrigation professionals from the private sector to manage the irrigation systems. Measures of junta progress include:

- Equitable allocation and distribution of water to users regardless of parcel size;
- An end to water sales to the rich and powerful by government-appointed ditchtenders;
- Democratic resolution of conflicts over water use and system maintenance;
- Farmer willingness to pay water fees and to accept fee increases; and
- Government willingness to allow juntas to retain and use fees.

While progress has been good, we foresee financial problems. The budget prepared by the YSURA junta for 1989/90 indicates a shortfall between revenues and projected expenditures of RD$ 180,000. The shortfall will be made up by deferring expenditures for repairs and maintenance. This is the same short-sighted policy followed by INDRHI that led to gross deterioration of the irrigation and drainage facilities. Also, amounts budgeted by the juntas are insufficient to support normal and regularly scheduled preventive maintenance of facilities and equipment.

Timely and adequate water delivery to users in all parts of the irrigation system are indispensable to junta viability. Farmers will continue to pay fees only if water service meets their needs. Water delivery depends upon adequate O&M. Attention to maintenance, as reflected in budgets and attitudes, will be of critical importance in the next few years.

Recommendations

In the end, juntas must depend entirely upon financial support from membership for system O&M. But for the immediate future, these recently formed institutions will need modest outside assistance if they are to become self-sustaining. The team recommends that:

- USAID should continue assistance to the two juntas beyond the current project assistance completion date by programming fixed amounts of local currency (RD$) for a period not to exceed three years. Support should be provided under a matching fund arrangement between USAID and the juntas. Use of funds should be restricted and used only for

irrigation and drainage facilities repair and maintenance, or for equipment repair, replacement or rental;

- Heavy equipment budgeted under OFWMP and promised to juntas should be made available at the earliest possible date;

- Future USAID assistance for the project areas or the juntas should be programmed in consultation with the juntas;

- Future USAID support to the Dominican irrigation sector should be made dependent on passage of national legislation to legalize the status of the juntas;

- The juntas, with USAID-supported assistance, should estimate the full O&M costs of the irrigation and drainage systems, and plan to gradually increase their water charges and fee recovery to cover necessary maintenance expenditures and to permit accumulation of cash reserves; and

- The Mission should maintain interest in junta development — an institutional innovation that USAID has helped establish. USAID can help ensure the well-being and permanence of the juntas through a longer-term presence via (1) staff visits to project areas, (2) sponsorships of workshops/seminars dealing with project achievements, and (3) financing reports that document project results.

TRANSFER OF IRRIGATION SYSTEMS TO WATER USERS

Findings

USAID's decision in 1986 to refocus the project from improvement of the physical works toward turnover and user control was pivotal. In only two years, OFWMP successfully facilitated transfer of two large agency-managed irrigation systems to private groups. This reverses a 75-year-old pattern of increasing state control over small-farmer agricultural production.

Working from an already-established institutional policy in support of turnover, OFWMP influenced INDRHI to transfer the responsibility for irrigation system O&M at levels below the main system to WUOs. By the early 1980s, INDRHI had recognized the benefits of turning over portions of irrigation systems to users. USAID, with its new emphasis on privatization, linked WUO formation to turnover, providing initial impetus to the transfer process. Thus, the initial success of turnover in YSURA and PRYN Contract I owes much to the fortuitous convergence of interests on the part of USAID and OFWMP, INDRHI, and farmers, and to the provision of appropriate incentives for INDRHI, the farmers, and junta members to participate in the process.

OFWMP has helped bring about a change in INDRHI from a focus on planning and construction to one of increased concern for water use, system management, and equitable water delivery. The reorientation is evidenced by changes in INDRHI professional staff, with agronomists currently more numerous than civil engineers. OFWMP's impact upon INDRHI derives in part from staff training abroad under project sponsorship.

Recommendations

Building upon the human, managerial, and organizational achievements of OFWMP, INDRHI is considering turnover of other systems to organized water users. USAID should capitalize on OFWMP achievements by continuing to support and encourage INDRHI's turnover of other irrigation systems in the country. The Mission should make future support to INDRHI dependent upon establishment of a timetable for turnover of other irrigation systems. INDRHI staff trained by the project should be used strategically to facilitate the turnover process.

RESEARCH, ANALYSIS, AND MONITORING OF OFWMP

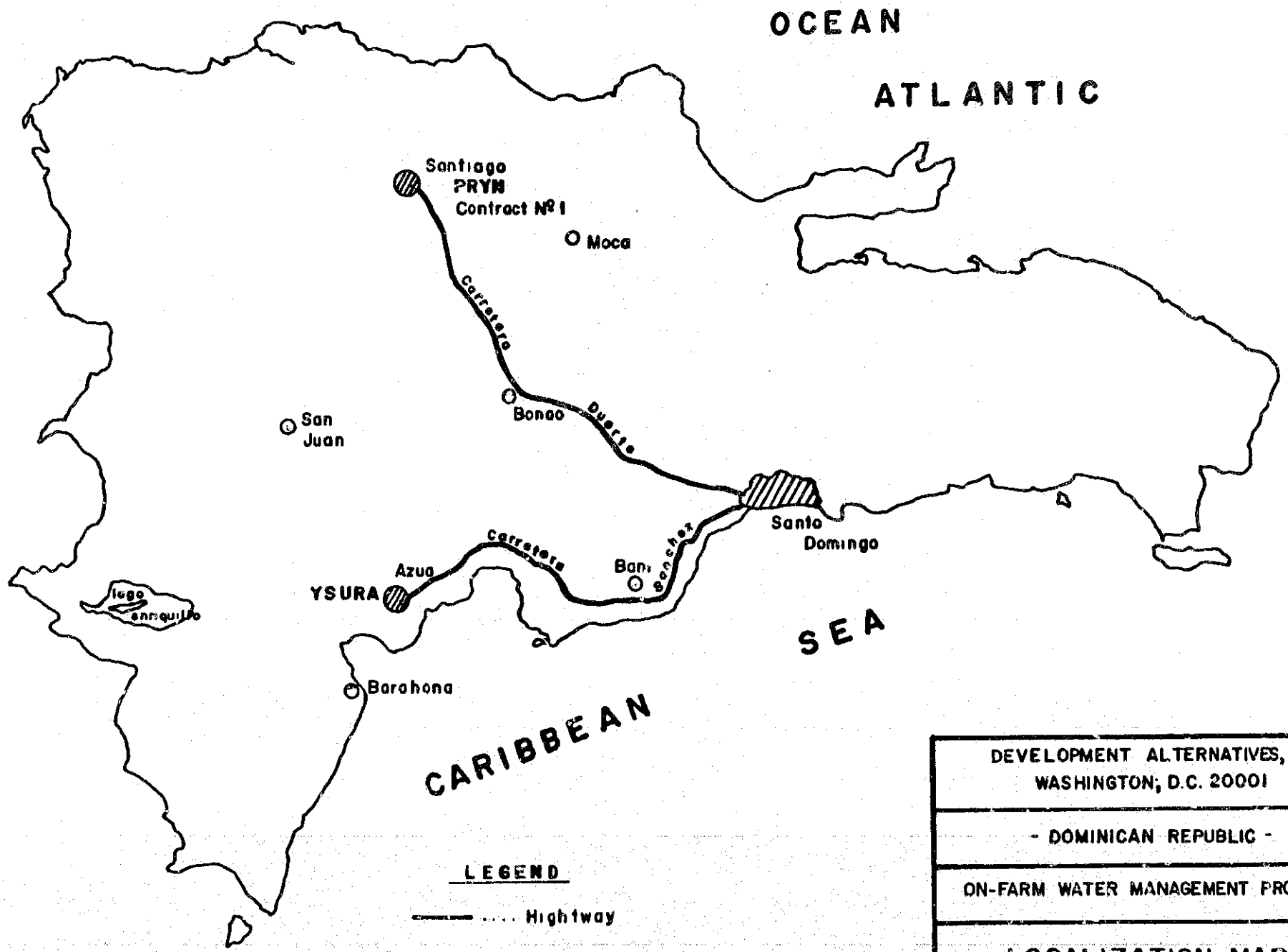
Research and Analysis

One weakness of the project is that, although data continue to pour in, most are of dubious quality and they are rarely analyzed. We recommend that the Mission arrange short-term assistance to OFWMP staff to help them (1) reorient portions of their data collection efforts and (2) begin to analyze the data already obtained.

Monitoring of Project Achievements

Although it is likely that OFWMP will leave a permanent mark on irrigation institutions in the Dominican Republic, the project's achievements are not well documented, nor are they widely known in the international irrigation community. The evaluation team recommends that the Mission sponsor an objective and thorough analysis of lessons learned in the project and ensure that results are published and disseminated.

Evaluators urge USAID to set out a list of technical, agronomic, social, and institutional indicators before September 1990, and to continue measurement of these indicators beyond the end of the project to monitor the sustainability and the utility of project innovations. Because of the great promise of the turnover model and of the juntas, USAID should commit resources to monitoring the indicators over the next five years.



MAP 1

DEVELOPMENT ALTERNATIVES, INC. WASHINGTON; D.C. 20001
- DOMINICAN REPUBLIC -
ON-FARM WATER MANAGEMENT PROYECT
LOCALIZATION MAP
DATE : 10 - 2 - 90

MAP 2

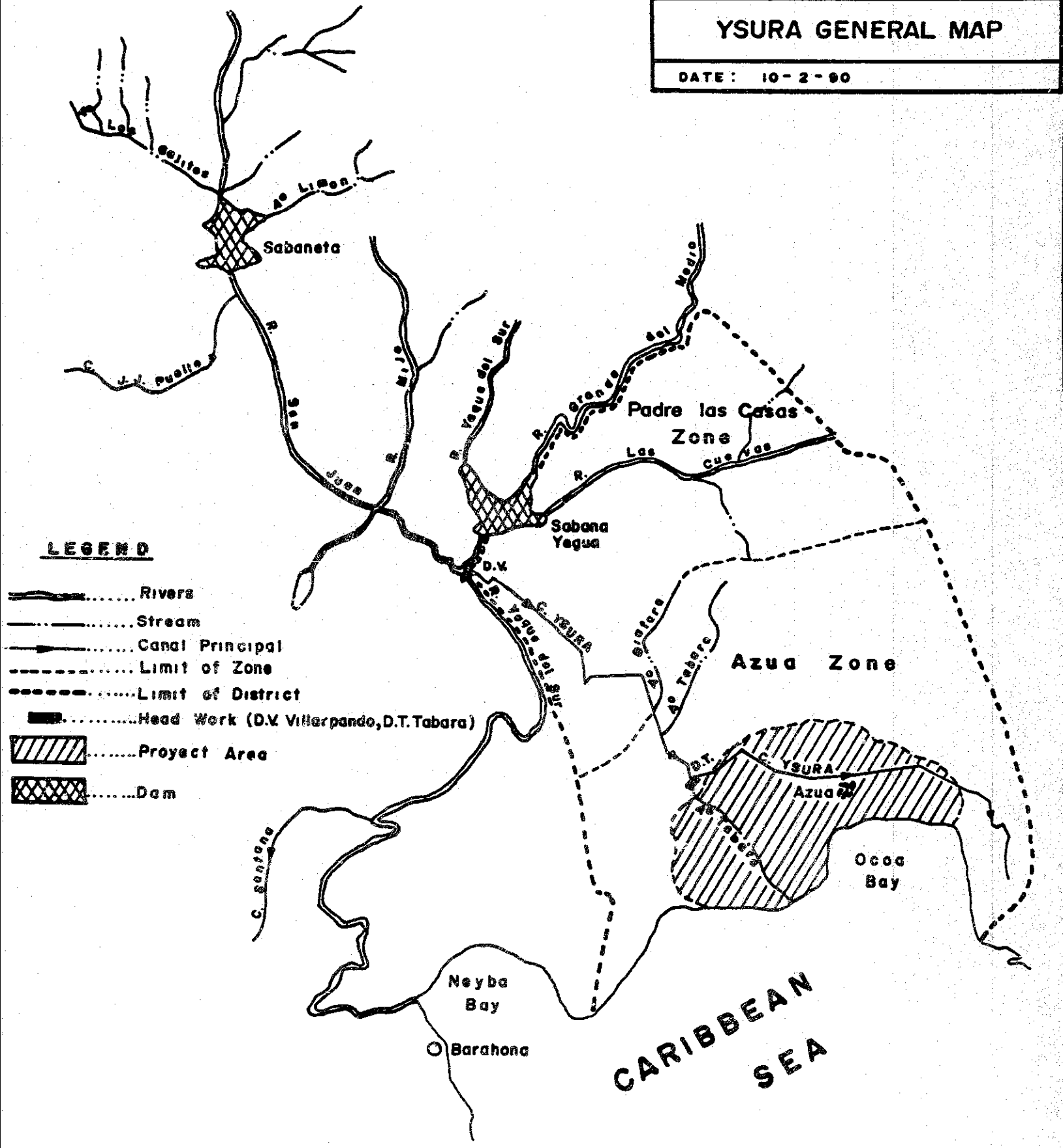
DEVELOPMENT ALTERNATIVES, INC.
WASHINGTON, D.C. 20001

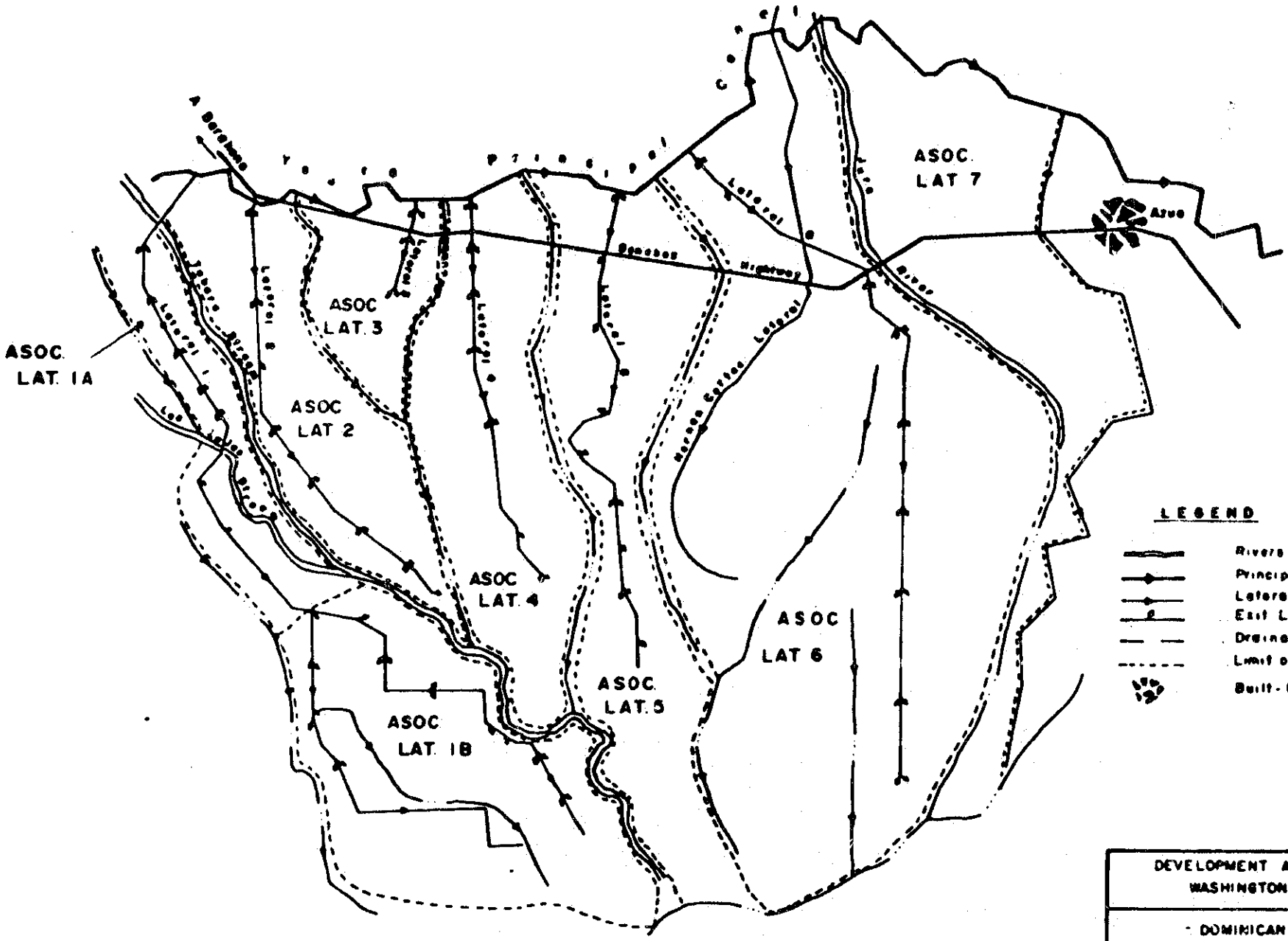
- DOMINICAN REPUBLIC -

ON-FARM WATER MANAGEMENT PROYECT

YSURA GENERAL MAP

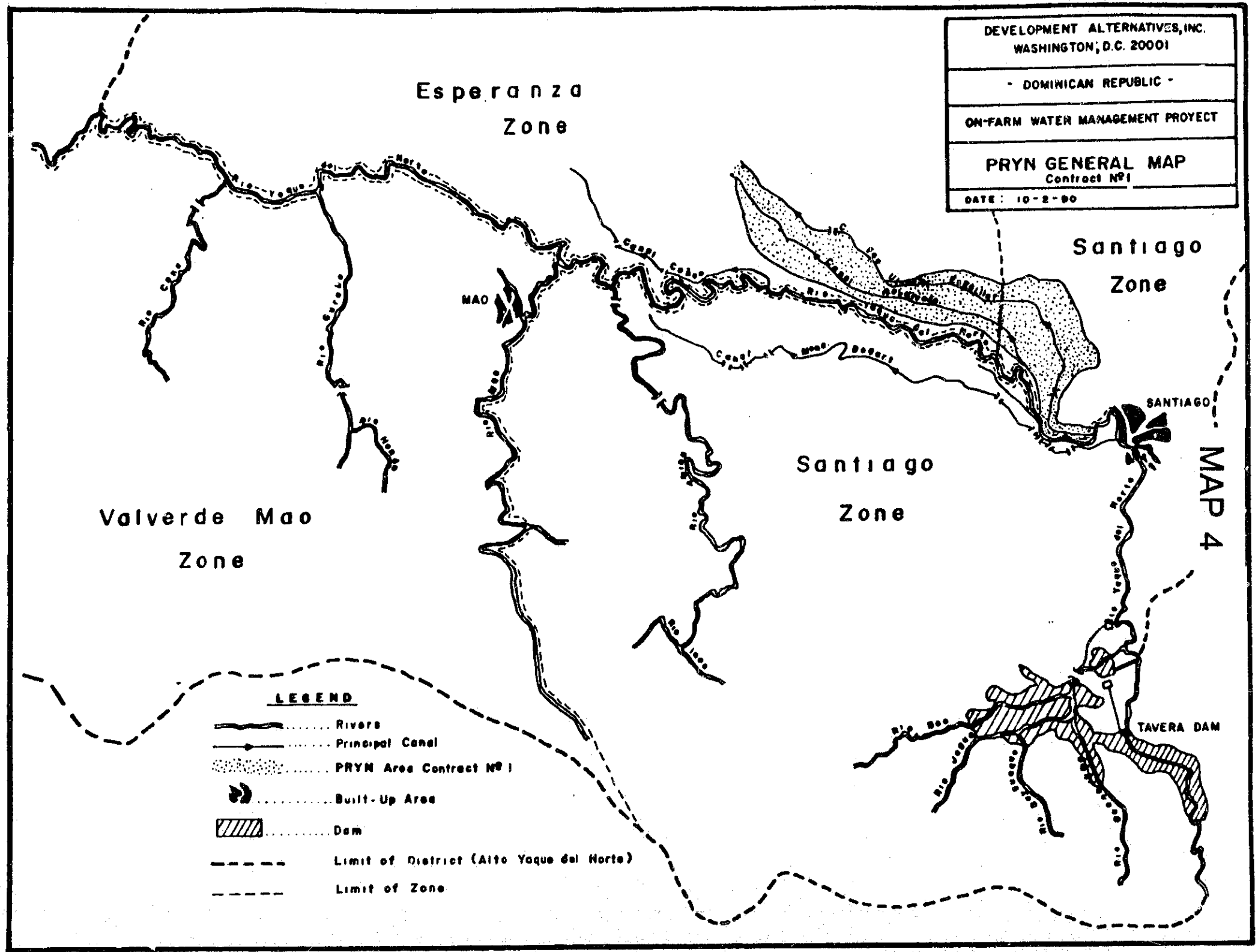
DATE : 10 - 2 - 90

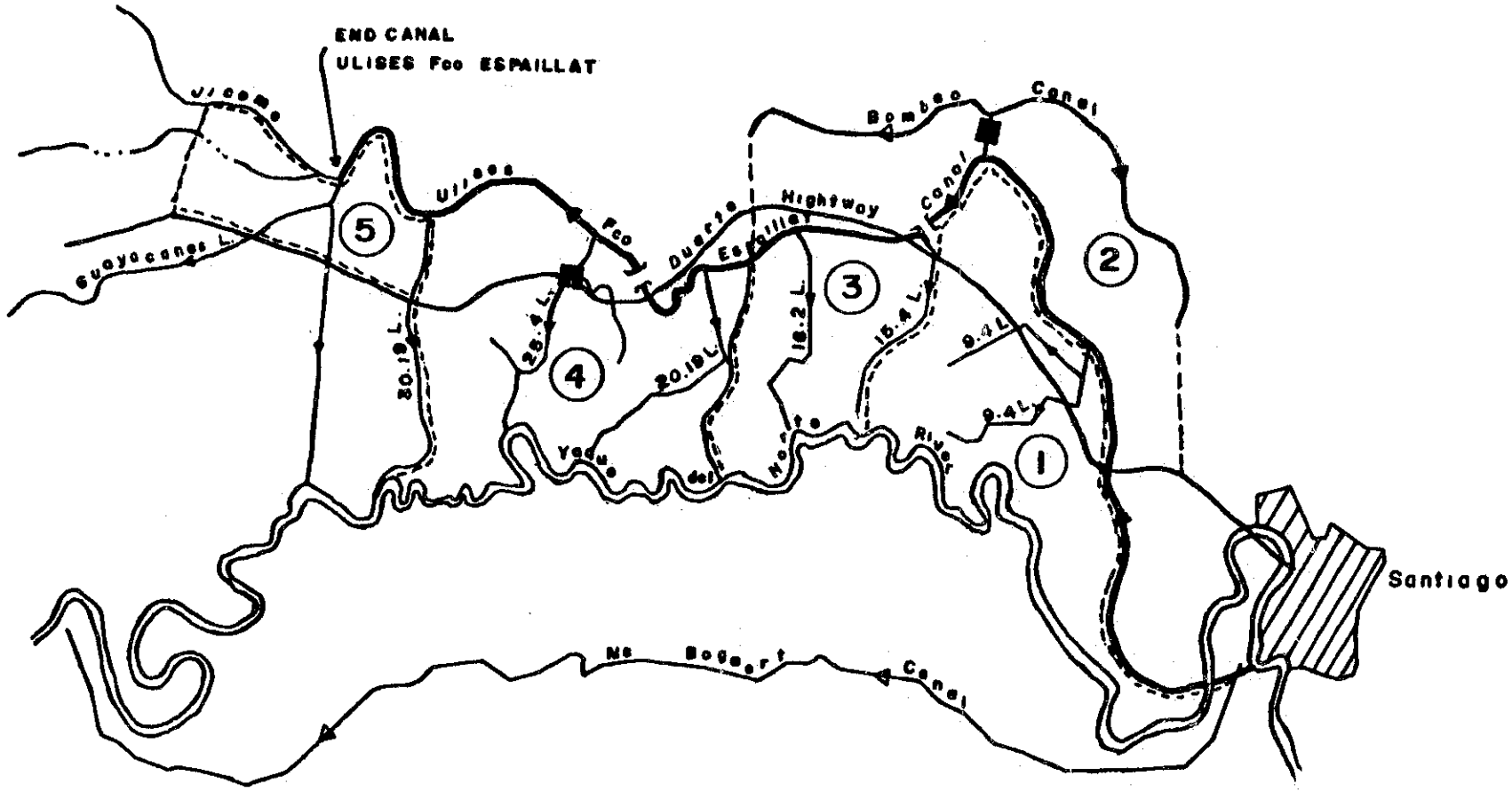




MAP 3

DEVELOPMENT ALTERNATIVES, INC. WASHINGTON, D C 20001
- DOMINICAN REPUBLIC -
ON-FARM WATER MANAGEMENT PROYECT
IRRIGATION ASOCIATIONS (YSURA)
DATE 10-2-90


DEVELOPMENT ALTERNATIVES, INC.
WASHINGTON, D.C. 20001
- DOMINICAN REPUBLIC -
ON-FARM WATER MANAGEMENT PROYECT
PRYN GENERAL MAP
Contract Nº1
DATE : 10-2-90
Esperanza Zone
Santiago Zone
Valverde Mao Zone
Santiago Zone
MAO
SANTIAGO
TAVERA DAM
MAP 4
LEGEND
Rivers
Principal Canal
PRYN Area Contract Nº 1
Built-Up Area
Dam
Limit of District (Alto Yaque del Norte)
Limit of Zone



MAP 5

LEGEND

- Rivers
- Principal Canal
- Lateral
- Drenaige
- Limit of Sector
- Pump Station
- Built-Up Area

ASOCIATIONS

1. Santiago
2. Bombeo
3. Villa Gonzalez
4. Navarrete
5. Ponton

DEVELOPMENT ALTERNATIVES, INC.
WASHINGTON; D.C. 20001

- DOMINICAN REPUBLIC -

ON-FARM WATER MANAGEMENT PROYECT

IRRIGATION ASOCIATIONS
(PRYN Contract Nº 1)

DATE : 10 - 2 - 90

1

INTRODUCTION

PURPOSE

The purpose of this evaluation was to assess the validity of the On-Farm Water Management Project (OFWMP) objectives, to determine the extent to which they were achieved, and to make recommendations regarding future Mission support to water user organizations (WUOs) in Azua and Santiago,[1] and to other irrigation systems in the Dominican Republic. The evaluation focused on field activities, particularly the formation and viability of WUOs and the implementation of the transfer model (turnover) in the country. The timing of the team's visit dictated that evaluation be more an end-of-project evaluation than a midterm evaluation.

EVALUATION TASKS

To determine the impact of the OFWMP on the irrigation sector in the Dominican Republic and on the viability of the WUOs created by the project, the team examined the following:

- Institutional issues;
- Irrigation system rehabilitation issues;
- Technical assistance (TA) issues;
- On-farm water management issues;
- Organizational and financial viability of WUOs;
- Environmental issues; and
- Training activities.

EVALUATION METHODS

The evaluation consisted of four components: document review; interviews with personnel affiliated with Utah State University (USU), the Instituto Nacional de Recursos Hidraulicos (INDRHI), the United States Agency for International Development (USAID), the Juntas de Regantes, other institutions, and with farmers resident in the Yaque del Sur (YSURA) and Proyecto de Riego Yaque del Norte (PRYN) project areas; inspection of physical works; and observation of the Juntas Directivas and technicians employed by the juntas in the project areas.

The team used a participatory methodology to obtain the documentation and information required for the evaluation. INDRHI and USAID staff made project data available to

the team. Quantitative data were reviewed with field staff in both project areas to assess their accuracy.

Evaluators interviewed members of the Juntas Directivas, their administrators, and many of their technicians individually and in groups. In addition, team members visited head- and tail-end farmers on rehabilitated and unimproved laterals in both systems, accompanied by junta technicians or Junta Directiva members. About 50 farmers were interviewed individually and in groups. However, due to the limited time available, field interviews were largely concentrated along the lateral and sublateral canal rights-of-way. For this reason, our sample of farmers included an elevated number of ditchtenders.

To compensate for sampling bias, team members supplemented YSURA field visits with raw interview data for a 5 percent sample of farmers in the project area. These interviews were conducted by the OFWMP socioeconomic staff. Because we interviewed along the canal rather than at home, in most instances,[2] and because we did not wish to take harvesters' time away from their labors, very few women were interviewed.

Following the field visits, and before writing the chapters of this report, the team met as a group to reach consensus on main findings, problems, and recommendations. This meeting lasted a full day.

NOTES

1. A Localization Map showing Azua (YSURA) and Santiago (PRYN Contract I) follows the Executive Summary. In all, five maps are furnished: (1) Localization Map; (2) YSURA General Map; (3) YSURA Irrigation Associations; (4) PRYN General Map (Contract I); and (5) PRYN Contract I Irrigation Associations.

2. YSURA farmers generally reside in nucleated settlements. Some of these are scattered in the project area; others are new settlements at some distance from the field.

2

OVERVIEW

BACKGROUND

Agriculture in the Azua Area

Agriculture has maintained a precarious toehold in the Azua Valley in the past century. Despite the fact that it is a semiarid, subtropical thorn woodland zone,[1] occasional torrential downpours coupled with poor water management have led to waterlogging of some soils. A thriving sugar region in the 1870s, Azua languished a decade later (Baud 1987). In the first half of this century, banana and sisal plantations were created and abandoned. Contract tomato production was introduced in Azua in the early 1960s, and melon production for export in the past decade. Production of these crops, as well as that of bananas, plantains, beans, cassava, sorghum, and others is totally dependent upon irrigation.

To achieve sustainable, balanced agricultural land use in the valley requires a sharp break from past cycles of environmental degradation, low land productivity, impoverishment, and outmigration. Whether this can be achieved through sound water management is an open question. At present, production of tomatoes, melons, and a number of other crops is seriously threatened by the spread of viruses transmitted by the white fly, an insect resistant to many pesticides. Waterlogging and salinization remain major constraints to production; soil erosion in the watershed and in the project area contributes to sedimentation of the Sabana Yegua reservoir and system canals (Jones et al. 1985).

Agriculture in the Santiago Area

In contrast, the Cibao, a subtropical, moist forest zone, enjoys annual rainfall averaging 1,200 mm. Peasant-based agricultural production has been tightly linked to the Dominican Republic's export economy since the late nineteenth century (Baud 1987; San Miguel 1989). Tobacco production dominated the agricultural sector in the nineteenth century; it continues to play a significant role in the local economy along with livestock production. Until the 1980s, rice was irrigated, but INDRHI regulations now restrict water deliveries for rice except for that planted on small pockets of heavy, poorly drained soils. Irrigated sorghum, corn, and beans are produced for market. Plantains, bananas, root crops, and other vegetables are also produced in the PRYN Contract I project area for home consumption and limited commercial production. The extension of irrigation into the project area has increased the cultivable area. Drainage is a concern, but of less-critical importance than in Azua.

The long history of sustainable peasant production in the Cibao has produced a tightly woven institutional fabric in support of agriculture. Private and public sector institutions support tobacco production, livestock improvement, credit, marketing, and input

supply. Credit from the Banco Agricola is generally available. Crops may be marketed through the Bank, the Ministry of Agriculture (SEA), or through local intermediaries. While *Thrips palmi* presents problems for eggplant and oriental vegetables in the region, heavy crop losses and pesticide abuse are notas apparent in the Cibao as in Azua (AID/Santo Domingo 1989). In a 1988 survey of the project area, farmers cited impassable roads as a major cause of crop loss (Jerez 1988).

Land-Tenure and Land-Labor Relationships

Agrarian reform settlements (*asentamientos*) are a salient feature of recently installed irrigation systems in the Dominican Republic. A 1980 amendment to the Dominican Water Law allows for the creation of new land reform settlements in the following manner:

- Landowners who benefit from new irrigation works constructed by the State pay for the infrastructure by ceding half of their unirrigated lands that were cultivated before the system was built and 80 percent of their lands that had not been cultivated to the Instituto Agrario Dominicano (IAD).[2]

- The IAD redistributes use rights to these lands to agrarian reform beneficiaries (*parceleros*).[3]

- Irrigated lands in the new command area are exempt from this provision.

- Holdings of 6 hectares (100 tareas) or less are exempt from this provision.

  Holdings will not be reduced to less than six hectares by this provision.

Thus, in the command area of recently built, state-owned irrigation systems, we find private holdings in previously irrigated portions of the systems (such as the Hernan Cortez Canal in YSURA or below the Navarrete canal in PRYN Contract I). In newly irrigated zones, reduced, but still large, private holdings are interspersed with private farms of six hectares or less and agrarian reform settlements.

Dismantling of a state sisal plantation in 1961 created the first agrarian reform settlement in Azua. The reform process accelerated with construction of new irrigation infrastructure in the late 1970s and resettlement of Sabana Yegua residents and hurricane victims in 1979.[4] Agrarian reform beneficiaries include *parceleros*, full members of the settlement organizations or *asentamientos*, who hold two to three hectares; and *pedaceros*, settlers provisionally located within the project area whose access to land is less secure and whose holdings are much smaller (generally less than one hectare). Initially collective production units, *asentamiento* lands were divided among beneficiaries in 1983. The associations created by IAD to manage production still exist, but their functions have been reduced to providing machinery and channeling credit from the Banco Agricola to the farmers who lack title to their lands.

In the PRYN pilot area, 68.4 percent of irrigators are agrarian reform beneficiaries (Jerez 1988). In this area, IAD associations appear to be more viable. While *parceleros* hold their plots individually, they often plant and harvest collectively to achieve economies of scale.

In both areas, *parceleros* enjoy rights of possession to their lands, but title remains with the IAD. This limits their access to credit. To get credit, farmers can borrow from the Banco Agricola through their land reform association, or produce industrial or export crops (often under contract) for agribusiness enterprises. Contract agriculture has three positive features for contracted farmers: (1) companies provide markets for major crops, (2) companies pay wages for farm labor, and (3) they provide credit in a region where other sources of credit are scarce and not often timely. However, Azua farmers that we

interviewed complained about the low (or negative) returns to and high risks associated with tomato and melon contract production. Their income from sale of the crops often fails to cover the cost of their loans. Contract arrangements transfer most of the risk associated with production to the farmers. Contract production also occurs in Santiago, but access to credit and markets appears to be far better than in Azua and contract terms have been more favorable to the farmers (Jerez 1988).

The Irrigation Systems

Before 1979, irrigation waters in the Azua valley came from the Jura and Tabara rivers and from groundwater. These were sufficient to irrigate only a portion of the present project area. The present YSURA system was designed in the mid-1970s by a Mexican firm and funded by the Inter-American Development Bank. In 1978, 5,500 hectares in Azua were being irrigated (Hartshorn et al. 1981). Ballard (1985) suggests that the present system may have been put into operation hastily in response to political pressure, but, in any case, drainage works were omitted.

Waterlogging may have been a problem before construction of YSURA, but hurricanes David and Frederick resulted in major flooding problems. In 1982/83, the first major drainage canals were put into operation (Ballard 1985). A second problem with the YSURA project in the early 1980s was that INDRHI made no provision for system maintenance. By 1984, the system was in a state of serious deterioration (USAID Project Paper; Ballard 1985).

Large-scale irrigation development in the Santiago began in the 1920s, but construction halted with the Depression. In 1938, a major canal and road building program was undertaken with conscripted peasant labor (San Miguel 1989). The Navarrete canal was a product of this first phase of irrigation development. The new Canal Ulises Fco. Espaillat was constructed above and roughly parallel to the old Navarrete canal that is still in use. The canal is fed by a series of dams constructed in the early 1980s for power generation as well as for irrigation.

INDRHI

INDRHI is responsible for planning, development, and regulation of water resources. The agency has statutory authority to investigate potential and proposed water resource developments, to determine availability of water, to grant rights to the use of water, to adjudicate and allocate water between competing applications, and to charge and collect fees for the use of water. INDRHI was created by statute in the mid-1960s, and began an extensive program of project planning and development that included construction of dams on most of the country's major rivers for irrigation and hydropower, the construction of new irrigation conveyance and distribution systems, and extensive rehabilitation of older systems.

INDRHI is divided into four departments: Planning, Projects, Administration, and Irrigation Districts. For field operations, the country is divided into eight districts, which are subdivided into zones (and occasionally subzones) and sectors. Districts are usually divided on a watershed basis, although rivers sometimes are boundaries. Irrigation systems and related projects comprise only a small portion of the area of a district. For example, the Ozama-Nizao District, in the southeastern part of the country, covers 14,900 square kilometers. It is divided into four zones, and has 44 irrigation projects (systems), but these contain a total of only 265 square kilometers.

The Irrigation Districts Department (DDR) has responsibility for system operation and management (O&M) at the lateral level and below. These are district and zonal functions, and ones which tend to be underbudgeted, of minor concern to INDRHI, and, therefore, often neglected. All major

decisions, particularly on funding and expenditures, are made at the DDR level and above. Good O&M of the irrigation systems is made more difficult because most of the lowest field positions, such as ditchtender and maintenance man, are filled by political appointees, few of whom have had any irrigation system experience or feel any responsibility to either the farmer or INDRHI.

THE OFWMP

Objectives

According to the 1983 Project Paper, the goals of the OFWMP were first "to increase the income and standard of living of Dominican farmers by increasing their productivity," and, second, "to develop the human resources and institutional conditions necessary for increased productivity in irrigated agriculture." The purpose of the project, funded by a $12.0 million loan to the Government of the Dominican Republic (GODR), is to strengthen the capacity of the Dominican government to:

> "Effectively plan the development of its water resources for irrigation,
>
> Plan and operate irrigation systems,
>
> Support increased agricultural productivity under irrigation, and
>
> Prevent and/or correct the deterioration of land resources already under irrigation" (Project Paper, 12).

Funds for the project were authorized on June 30, 1983 and obligated on the same date. Conditions precedent to disbursement for technical assistance were met on June 5, 1984, and an eight-person team of long-term advisors arrived in the Dominican Republic in 1985. A 1986 change in project focus and strategy resulted in a shift in project priorities to promote rapid development of WUOs and distribution system turnover to water users: written project objectives did not change.

Strategy and Methods

In the Dominican Republic, irrigation is practiced by 58,000 farmers[5] who irrigate 223,000 hectares.[6] In YSURA and PRYN Contract I areas, 6,000 farmers till 14,400 hectares. OFWMP pioneered strategies using the YSURA and PRYN Contract I areas as prototypes for introduction of organizational and turnover models throughout the country.

Major project design components included:

- Completion/rehabilitation of principal irrigation and drainage facilities in YSURA and PRYN Contract I;
- Establishment of centers for water management in the two areas;
- Use of pilot areas within each of the systems for research, training, and demonstration; and
- Development of a series of technical field studies, including benchmark data collection.

The original project design concentrated on technical engineering and agronomic interventions: water measurement and control, on-farm water use efficiency, land leveling, and the growing of crops under improved management practices. The Project Paper also called for a small-farmer credit program, a component that was eliminated in 1986.

The Utah State University and Chemonics International Consulting Division's initial workplan included the following activities:

- Technical assistance in drainage and system rehabilitation;

- Technical studies focused primarily on activities in pilot areas in each of the two systems;
- Improvement of on-farm water management involving water user groups;
- Institution building and WUO development; and
- Training of INDRHI personnel, technicians, extension personnel, and farmers.

Although the main achievements of the project, other than the physical rehabilitation of works, have been socio-institutional, the role of farmers in determining on-farm water management received relatively little attention in the initial design and original activities of OFWMP.

The project reorientation that took place between 1985 and 1987 resulted in sequential emphasis being placed on (1) physical works rehabilitation, to allow for (2) WUO formation, as a way to achieve the objective of (3) system turnover. Increased attention was also given to drainage works, and provision was made for establishment of pilot drainage areas in each of the two systems.

Applied Research and Monitoring

Between 1985 and 1987, OFWMP shifted away from applied development research and the generation of baseline data to WUO development and turnover. While it was not the Mission's intent to stifle applied research, it did not accord high priority to evaluation of research conducted before 1986, nor did it attempt to ensure that continuing data collection would be based on sound research design. As a result, the team could not find reliable or meaningful baseline estimates of such indicators as cropping intensity, service area, land use, water distribution equity, total areas requiring rehabilitation (lengths of sublateral, waterlogged, or salinized areas), areas requiring leveling, and socioeconomic indicators outside pilot areas.

In planning projects, it is well, at the outset, to define and clarify the questions to be answered at the end, and to plan the research data collection and analysis with the utility of the end product in mind. It is difficult to detect this orientation in the data generated by the project. A great deal of data have been collected, but inappropriate data were sometimes collected, data from the two project areas were not always comparable in quality and quantity, and analysis and conclusions drawn from the data are sparse.

Principal Constraints

External Constraints

The major constraints to sustainability of the OFWMP's achievements are external to rather than internal to the project. The former include the variable nature of project farmers' prior irrigation experience, the limits on returns to agricultural production posed by current price and credit policies and programs, physical and agronomic constraints unrelated to water delivery, and institutional constraints.

Irrigation Experience of Farmers. The overwhelming majority of farmers in both the YSURA and PRYN Contract I areas had worked with irrigated crops prior to completion of the existing systems. A far smaller number, however, had experience irrigating the crops that they now grow under the conditions that now prevail. Lack of familiarity with water management in arid conditions is a serious concern in Azua because (1) the Valley poses special drainage problems, and (2) many agrarian reform beneficiaries came from hill lands outside the region.[7]

Credit and Contract Agriculture. Contract agriculture is prevalent in Azua. In January 1989,

tomatoes and melons were produced on 41 percent of the cultivated area. In the past, contracting enterprises paid the water fee to INDRHI on behalf of the farmer and passed on fees in loan packages to farmers. Since 1989, however, the Azua junta has required that farmers pay directly at the Junta Directiva office at the junction of the roads to Barahona and San Juan. This change will make farmers more aware of junta activities, but YSURA junta directors expressed concern (1) that fees will not be paid in cases where contract farmers cannot repay their loans, and (2) that it will not be possible to raise water charges unless area farmers can count on better and more secure markets for their crops.

Physical and Agronomic Constraints. Soils in both project areas are generally deep and fertile. They are a constraint only where drainage and salinity are problems.[8] Water is abundant. At present, the principal agronomic constraints to irrigated agriculture in the project areas are insect pests. Data on the relationships governing farming systems, water use, and pest control are not generally available and need to be collected to formulate appropriate pest management strategies for irrigated agriculture. This is especially important in light of the white fly infestation in Azua and *Thrips* problems in Santiago.

Institutional Constraints. The President of the Republic has transferred responsibility for irrigation system O&M to YSURA and PRYN farmers in impressive ceremonies. Transfer was by presidential decree but it has not been backed up by law. The Juntas de Regantes lack legal authority for their operations. The Water Law allows INDRHI to delegate functions to WUOs. However, responsibility for imposing sanctions for water theft and for vandalism is vested in district water courts. The juntas do not have clear legal authority to collect and use water fees.

The INDRHI-junta interface has not been clearly defined, and there has been no clear division of responsibilities for water management. Neither have responsibilities for drainage and flood control been separated or defined.

Local institutional development is weak in Azua. Agencies of the national government — SEA, IAD, the Banco Agricola — function poorly if at all. Local economic institutions such as informal credit and marketing arrangements were poorly developed in 1984 and we found no evidence of change (Ballard 1985). This does not appear to be a severe constraint in Santiago.

Interinstitutional collaboration is still largely in the planning stage, particularly in Azua. This contributes to a tendency on the part of INDHRI and the juntas to take on activities such as agricultural extension and marketing that are considered peripheral to junta functions.

Internal Constraints

Organizational Experience. WUOs in both YSURA and PRYN Contract I are very young.[9] Because they are pilot efforts, they cannot rely upon the experience of other associations. Junta Directiva members lack experience and training in business and financial management. This problem is exacerbated by frequent elections and rapid turnover of membership. Because the process of organization was rapid, membership is widespread, but levels of farmer involvement in Association activities and decisions are still low (Jerez 1988; OFWMP/Centro Sur 1989; Veras et al. 1989). Structural changes may be required to achieve more equitable representation of farmers within the system.

Budgetary Constraints. At present, water fees barely cover costs of operating the systems. Budgets do not cover adequate maintenance, including equipment necessary for this purpose. To maintain present levels of farmer participation and fee payment, the juntas will have to maintain existing levels of service delivery. Whether or not they can do this is an open question.

SUMMARY

OFWMP's activities in the two irrigation systems serving 14,400 hectares can be considered a pilot effort for introduction of the turnover model in other irrigation systems in the country. The project resulted in new construction and rehabilitation improvements to the YSURA and PRYN Contract I areas. The original project design concentrated heavily on engineering and agronomic research; in 1986, project emphasis shifted to farmer organization and turnover.

The project would have benefited from more careful attention to applied research, and particularly to analyses and to the testing of alternative technologies replicable in other regions. The early establishment of reliable baseline indicators and their continued monitoring would have allowed stronger conclusions on project accomplishments.

NOTES

1. According to Delaine (1987), annual rainfall in Azua averages 373 mm. and generally falls from May-August (Delaine 1987). Hartshorn et al. (1981) indicate an average annual rainfall of about 700 mm. for the region.

2. Ley 126 (ley de la cuota parte), amending Chapter III of Ley 5852, "Sobre Dominio de Aguas Terrestres y Distribucion de Aguas Publicas."

3. In the PRYN Contract I Project area, IAD exchanged land with private owners to consolidate settlement areas.

4. In a 1986 survey of 211 landowners in the OFWMP pilot area, Mejia and Delaine (Delaine 1987) found that 79 percent were agrarian reform beneficiaries.

5. World Bank, 1986, Volume II, p 214.

6. World Bank, 1986, Volume I, p 10.

7. This phenomenon may be overemphasized in project documentation, because the 1986 socioeconomic survey focused exclusively on Azua lateral 2, sublateral 11, a newly cleared part of the Azua system settled by hurricane victims and former residents of the area covered by the Sabana Yegua reservoir. In contrast, survey data and the team's interviews with farmers reveal that a very large number of Lateral 6 farmers have a long history of agricultural employment in the area.

8. Several farmers in the Azua area attributed drainage problems in their fields to heavy irrigation of tomatoes by upstream neighbors. Recommendations for contract production tend to focus on the field rather than on the irrigated area as a whole. Ballard (1985) notes that this narrow view is not likely to affect tomato production as long as an adequate supply of well-drained land is available for production.

9. See Chapter Five for dates that laterals were turned over.

3

SYSTEM REHABILITATION ISSUES

PHYSICAL ACCOMPLISHMENTS

The evaluation team reviewed annual and periodic reports, and questioned INDRHI, junta, and consultant staff in Santo Domingo and the field in an effort to catalogue the accomplishments in physical works. In the end, we did not feel that we could fully rely upon data in the OFWMP annual reports. There is evidence of some double counting, lack of consistency in accounting from year to year, and differences between PRYN Contract I and YSURA. For example, although culvert crossings are reported in meters for Santiago, Azua reports these in numbers of units installed. Rehabilitation and new construction are not consistently defined. Sometimes regular maintenance is counted as rehabilitation. Therefore, we relied mostly on field interviews to obtain the data presented in Table 1, which is a summary of the physical works accomplished by the project to January 1990.

Accomplishments and our field observations do not tally well with the targets contained in the semiannual USAID project status reports. For example, according to Table 1, progress against drainage targets is good. Nevertheless, drainage works in YSURA are incomplete, as described later in this chapter. On the other hand, the table indicates that rehabilitation of irrigation canals is less than that targeted. Yet, in the field, the evaluation team was told that irrigation canal rehabilitation work was mostly completed. This leads us to believe that the USAID-established

TABLE 1

ACCOMPLISHMENTS:
PHYSICAL WORKS

Item	unit	1/90 YSURA	1/90 PRYN	1/90 Total	USAID Target
Rehabilitation[1]					
Main/lateral Canals	(km)	90	80	170	306
Tertiary Canals[2]	(km)	50	350	400	
Drainage Canals[3]	(km)	150	84	234	210
New Construction					
Tertiary Canals[4]	(km)	10	4	14	
Area Benefitted	(ha)	200			1150
Main (Collector) Drains	(km)	17	71	88	100
Area Benefitted	(ha)	300	1980	2280	1150[6]
Tile Drains	(km)	13.5[5]	4.2	17.7	
Culverts	(#)	28	96	124	
Roads	(km)	240	170	410	
Flood Control Levees	(km)	5			
Irrigation Gates	(#)	2576			
Road Crossings	(#)	8			
Land Leveling	(ha)	619	328	947	1150

Source: OFWMP Units in YSURA and PRYN, January 1990, and H. Yap.

1 Included are several channels which were redone several times. Only one-time counting has been used in the table.

2 Done by a tractor or grader on a regular basis. Only one-time counting has been used in the table.

3 Includes cleaning (chapeo).

4 Quaternary lining in pilot areas.

5 USAID target is for pilot areas.

6 To February 10, 1990.

targets may not have been carefully formulated. The progress in land leveling is close to that targeted.

Rehabilitation of YSURA is behind schedule and works are not likely to be completed before the project assistance completion date (PACD). Of principal importance are the drainage works associated with Lateral 6 and with the tail section of Lateral 1. These should be priority areas in which to concentrate rehabilitation efforts. Because the areas are severely waterlogged, there is no point in rehabilitating the irrigation facilities without first improving the drainage.

Major lengths of Laterals 1 and 6 have not been rehabilitated, and evaluators have personally observed serious problems in these and other areas. For example:

- In the Pueblo Viejo area, at about Turnout 25 of Lateral 6, farms 3 and 4 of the former owner have been given to reform beneficiaries. Of a total of 500 hectares, over half are waterlogged. The sub-laterals in the area have never been rehabilitated. In many places, in lieu of gates, lateral walls have been broken to let water into fields. This area contains most of the Azua farmers who are not yet organized into nucleos.

- At the bottom of lateral 5, 1.5 km remain unlined. 47 irrigators report waterlogging.

The PRYN Contract I area was turned over in better condition and more completely rehabilitated than were the Azua laterals. The chief of the rehabilitation section for OFWMP in Santiago told the evaluation team that rehabilitation work in the PRYN Contract I area was 90 percent completed. Major remaining tasks are installation of a few water delivery points (where deliveries are impeded by open drains) and drainage connections. However, there are still localized problems. For example, in Villa Gonzalez, 30 or more farmers are irrigating about 440 hectares out of the old canal that existed before rehabilitation. We were told that there are capacity constraints in the old canal.

In general, the quality of project-supported construction is considered adequate. We have some concerns about the deep flood control construction in YSURA, particularly where dewatering has resulted in sloughing. The project may wish to seek additional TA assistance in drainage/flood control planning and construction. For example, a more efficient and more easily maintained cross section for a combination drainage/flood control channel could be one with a small cross section for drainage and a road for maintenance all within a larger flood control channel. A sketch is indicated in Figure 1.

IMPACT OF REHABILITATION

Rehabilitation in YSURA and PRYN Contract I had two types of impacts. First, the rehabilitation facilitated the organizational efforts and allowed for establishment of WUOs. This is described in Chapter Five. Second, rehabilitation brought additional lands under production and resulted in more reliable irrigation service primarily to parcels located in tail portions of the irrigation systems. In YSURA, an additional 300 hectares were brought under production by the project, and an estimated 2300 hectares have benefited from more reliable irrigation service.[1] No estimates were available for new areas brought under production or for those receiving more reliable water supplies in the PRYN Contract I service area.

PILOT AREAS

Pilot areas were used in each of the two project areas to demonstrate the benefits from improved water management and drainage. The evaluation team believes that the concept of pilot areas was useful for purposes of demonstration, research,

and training. However, improvements to infrastructure in pilot areas are excessive relative to those in other portions of the irrigation systems. For example, in YSURA, the project installed almost 20 times the number of irrigation gates on Lateral 2 (which contains the pilot irrigation area) as were installed by the project in the rest of the entire system. Portions of pilot areas are showcases and are provided with facilities such as tile drainage and quaternary ditch lining.

We heard from farmers in Azua about their reaction to the concentration of resources in small areas, and to uneven distribution of benefits. Junta officials also expressed concern over their inability to collect fees from those who have not benefited from infrastructure improvement, and some project personnel found fault with the concentration of scarce capital and human resources in small areas. Junta viability is a critical project concern. Monies spent for infrastructure in pilot areas impede junta mobilization efforts to form nucleos and to strengthen participation of farmers because monies could have been used for rehabilitation of Laterals 1 and 6 (YSURA) and thereby have helped increase farmer membership in the junta.

There is question concerning whether these improvements can be replicated in other parts of the project areas, let alone in the nation as a whole, without major infusions of foreign capital. Do the benefits from concentrating large amounts of resources more broadly on a small area outweigh those of spreading these resources more broadly and alleviating problems in the entire project area?

We do not question the need for on-farm drainage. Some farmers have constructed small but deep open drains. This takes land out of production. Tile drainage is being demonstrated in pilot areas as an alternative to open drains. Although we have not had the data to run economic comparisons, the team does not believe that tile drainage will be cost effective. Without project support, we do not believe that farmers will install such drains. Nor do we believe that the tile drainage work has research benefit. For these reasons, we question the utility of continued project support for installation of tile drains.

The team recommends that additional work on the YSURA irrigation and drainage pilot areas be halted and construction/rehabilitation effort concentrated in the areas served by Laterals 1 and 6.

DRAINAGE AND FLOOD CONTROL

The evaluation team considers drainage of utmost importance, particularly in the YSURA area. Unless OFWMP completes the drainage work, there is little likelihood that it will be completed at all.

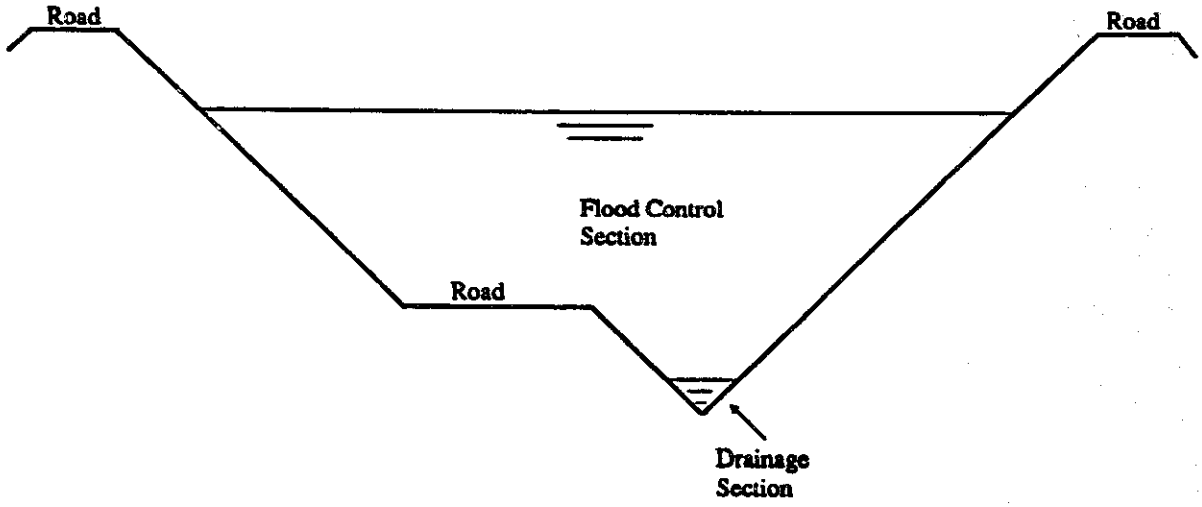
Tail-enders suffer from overirrigation by head-enders. Therefore, we believe that all farmers, head- and tail-enders alike, must share equally in the costs of maintenance of the drainage works. The responsibility for drainage system maintenance must be transferred to the juntas. Unless this is done, drainage will remain a need without any institutional responsibility.

As indicated in Chapter Eight, the juntas should be given heavy equipment necessary to construct and maintain drainage (and irrigation) facilities. However, we believe that much of the drainage maintenance can be accomplished through hand work and the rental of heavy equipment, particularly if changes in drain/flood control cross section is made following the idea provided in Figure 1.

At the same time, we want to make a distinction between drainage works (junta responsibility) and flood control works (INDRHI responsibility). Junta responsibility should include the maintenance of collector drain facilities that receive water from several farms or sectors for conveyance to major drainage/flood control

FIGURE 1

SKETCH OF FLOOD CONTROL/DRAINAGE CHANNEL



channels. However, the team considers that the construction in the El Rosario area of YSURA is a flood control function. INDRHI should maintain these facilities. Natural channels are part of the flood control system, as are levees used to protect towns and to channel waters.

SUMMARY

Most of the irrigation system construction and rehabilitation work targeted under the project in YSURA and PRYN-Contract I has been completed. However, it is unlikely that drainage works for Lateral 6 and the tail portion of Lateral 1, YSURA will be completed before the PACD. Completion of these drainage works should be assigned the highest priority.

In YSURA, the project has resulted in new irrigation service to an estimated 300 hectares and has made irrigation deliveries more reliable to an estimated 2,300 hectares.

Construction/rehabilitation work in pilot areas is considered excessive and should be halted. Once drainage works have been completed by the project, juntas should assume maintenance responsibilities for drainage facilities. INDRHI should take responsibility for maintenance of flood control channels.

NOTE

1. These estimates of project-derived changes are from the Chief of the Operations Section, OFWMP-INDRHI in YSURA.

4

ON-FARM WATER MANAGEMENT ISSUES

LAND LEVELING

Impressive results from the PRYN land leveling program are presented in the OFWMP 1989 Annual Report. Paired comparisons of bean production from farmers' fields before and after leveling (1986 versus 1988) indicate that per hectare benefits from a single crop more than pay for the cost of leveling, which runs about $US 130 per hectare. In addition to more equal water distribution on a leveled field, another effect from leveling is that farmers are often more willing to invest in other production inputs such as fertilizers or pest control measures. Farmers with leveled parcels also may have received a comprehensive package of technical assistance. If so, some of the positive results from leveling may be due to the TA. While OFWMP data show leveling's impact as positive, no analyses are provided to pinpoint why the leveling program has been so effective.

There may be several problems with the data and their analysis:

- Normally the impact of leveling on crop production, especially in the first one to two years, is negative because of movement of topsoil;
- We do not know if 1986 was a poor year (because of climate, pests, diseases, and so forth) for production of beans, and 1988 a particularly good year. To obtain this understanding, the project might have sought paired yield comparisons of bean production from fields that were not leveled; and
- We have no sense of the accuracy with which production and area data were taken.

The evaluation team was told that some of the few rice farmers in the PRYN Contract I area did land leveling themselves. The acid-test will be to see whether increased numbers of farmers pay for leveling lands for other crops. Would the juntas or a private contractor be willing to provide leveling services (and credit for farmers to avail themselves of leveling), on a cost-plus basis? If the leveling program can generate results as positive as the data suggest, farmers should be willing to make the investment.

WATER DELIVERY

Water delivery data for both PRYN and YSURA are well compiled and well presented. The PRYN data set deals with the upstream portion of the Yaque del Norte system. Because water may be used beneficially further downstream, there is perhaps little pressure to reduce water deliveries to the PRYN Contract I area. However, YSURA is at the tail of the Yaque del Sur system; losses from the system spill to the ocean,

and overirrigation has contributed to drainage problems. Consequently, interest in reducing water deliveries in YSURA has been strong. The evaluation team compared 1986 deliveries at Tabara with 1988 and 1989 deliveries at the same location:

Year	Average Flow (cu.m./sec)	Reduction in Flow From Base Year (percent)
1986	11.26	-
1988	7.54	33
1989	8.29	26

The data indicate a 33 and 26 percent reduction in flow entering the project area in 1988 and 1989, respectively. Between 1985/86 and 1989/90, the irrigated area increased by 3 percent and water deliveries throughout YSURA became more reliable (Chapter Three). These changes are significant accomplishments of OFWMP.

Reduction of inflow should reduce drainage problems in the lower portions of YSURA. The cost of this type of preventive action is insignificant in comparison with remedial drainage costs. However, the drainage problem will not be solved by preventive measures alone.

Water delivery data for YSURA, together with area irrigated (these data are not accurate), indicate that approximately 2.3 hectare-meters of water are being delivered to the project area for each hectare irrigated. This is somewhat more than twice the requirement for average crop evapotranspiration. Thus, overall efficiency, including losses in conveyance from Tabara plus on-farm losses for the project area, will be less than 50 percent. This is good by world standards, but there is still room for improvement. Water stage recorders could be placed at key locations where operating spills are made to obtain a better estimate of overall project water use efficiency and to pinpoint where losses occur.

WATER USE EFFICIENCY AND EQUITY

The project has had a poorly placed fixation on determination of on-farm water use efficiency. Instead, OFWMP should be concerned with improving project-wide water use efficiency. As indicated above, OFWMP has been very successful in YSURA in this regard.

The semiannual USAID status form has a line for reporting hectarage where on-farm efficiency exceeds 50 percent. To date, all parcels are reported to be operating at less than 50 percent efficiency. For many reasons, determination of water use efficiency on farmers' fields is not a good criterion to use in judging project performance:

- Where water supplies are abundant, as they are in YSURA and PRYN, individual farmers have little incentive to manage water efficiently. In contrast, when supplies become tighter, farmers naturally respond by better water management;

- Farm water use depends in large part upon delivery reliability in the main system. Where main system deliveries are unreliable farmers will normally respond by taking water out of turn, and by overirrigating to ensure that their crops are adequately supplied;

- Water management practices and, consequently, efficiencies vary widely with individuals and with soil textures; and

- Some of the water wasted by upstream users can be captured and reused by downstream irrigators. This was observed in both systems.

Equity in water distribution means that all farmers, including tail-enders, have relatively equal access to a fair share of water deliveries. The project has resulted in a redistribution of water with concomitant increases in equity and efficiency. Instead of addressing on-farm

efficiency, OFWMP should have been measuring equity of water deliveries. One way to do this is to measure actual flow against sanctioned (allocated) flow at the head and midpoint in each lateral (or at the head, middle-third and tail-third). Particularly in YSURA, OFWMP has been extremely successful in ensuring water deliveries to farmers in the far reaches of the system — areas that were inadequately served prior to the project. However, although we know this to be true, and although we are sure this has had considerable positive impact upon production, OFWMP has not monitored this factor and we could not quantify beneficial changes.

The team recommends that the project monitor equity in water distribution by placing water measurement devices at key points in the laterals. Determination of soil water properties and infiltration rates has little utility to INDRHI, juntas, or to farmers, and these measurements should be curtailed.

AGRICULTURAL PRODUCTION

The evaluation team is impressed with the manner in which OFWMP staff based in Santiago catalogued agricultural production data for project areas. OFWMP staff based in Azua have not obtained similar data. Staff from Santiago could help counterparts in Azua prepare themselves to obtain similar data for YSURA.

OFWMP data from PRYN Contract I indicate a marked upturn in yields and production. Unfortunately, absolutely no analysis accompanies the data presentation and we are unable to conclude why yields and production have improved. The Mission should be faulted for not sustaining essential research endeavors which could have provided baseline data and analysis (Chapter Eight). TA in agronomy or production economics should be sought to help OFWMP staff analyze field data.

Although production data are available for the PRYN project area, the evaluation team believes that production data should be used with great care to judge the accomplishments of an irrigation project. Agricultural production is the aggregate of yield, cropping intensity, the intensity of input supply, and area cropped. Too many variables other than water (such as weather or disease) affect yield. One must be careful to distinguish changes in yield as a result of the project from changes caused by extraneous factors. Although we believe that the project has increased cropping and output intensities and area cropped, preproject baseline data were insufficient to allow us to quantify these project-derived gains.

SUMMARY

Particularly in YSURA, OFWMP's accomplishments have been exceptional. The project has (1) reduced water deliveries to the project area, and (2) ensured reliable water delivery to tail-enders in the system. Unfortunately, the impact of water delivery on tail-end farmers is not documented. Measurement should be taken of water deliveries to head-, middle-, and tail-portions of the system, with an analysis made of water distribution equity.

Production data should be used with care to judge OFWMP performance. The project could be used to access TA to help analyze production data.

5

LOCAL IRRIGATION ORGANIZATIONS

OFWMP is a pioneering effort in the transfer of large irrigation delivery systems to water user groups. USAID has worked with organized groups of water users in Latin America to improve water management (for example, Plan MERIS in Peru), but turnover of agency water management functions to farmers in complex systems is rare. In the Dominican Republic, turnover means reversing a seventy-five-year pattern of increasing state control over all aspects of small farmer agricultural production (San Miguel 1989). OFWMP has (1) successfully organized groups of farmers to manage these systems and (2) facilitated the transfer of control from INDRHI to these groups. This achievement is particularly remarkable considering the presence of an entrenched bureaucracy, on one hand, and the heterogeneity of the project areas in terms of land tenure, land quality, crops produced, and farmers' prior experience with irrigation, on the other. However, these organizations are very young and fragile. They still need assistance to become truly self-sustaining.

TURNOVER IN THE YSURA AND PRYN CONTRACT I SYSTEMS

The farmers' role in turnover was initially passive. OFWMP's success in introducing order and equity into water delivery and visible benefits in terms of irrigation and drainage system rehabilitation provided strong incentives for farmer participation in the process. However, their continuing participation is likely to vary directly with the extent to which their well-being improves as a result of these efforts.

Junta directors and officers at lower levels serve without remuneration. Like other farmers in the zone upon whose continuing support they depend, their continued participation will depend upon reliable and adequate water delivery to their parcels, where that supply enhances their livelihood. Additional incentives for junta officers are status and prestige, and the opportunity to gain new skills in management and O&M of irrigation systems.[1]

The reorientation of OFWMP to focus on turnover initiated a new set of field activities beginning in early 1987. Activities of importance in this phase included the transfer of certain INDRHI functions to lowest-level WUOs (nucleos), Associations of nucleos, and federations of Associations (Juntas de Regantes).

YSURA

The OFWMP area of influence in the Azua Valley includes Laterals 1 to 6 and the Lateral Hernan Cortez, of the main YSURA canal. This is also the area of junta operations. Of its 4,464 water users, about 3,900 to 4,000 are members of nucleos; the remainder are not yet affiliated with these organizations. Table 2 shows the timing of transfer of YSURA laterals to users, and the assumption of

TABLE 2

TRANSFER OF YSURA LATERALS TO FARMERS

Date	Sector	Event
Oct 1987	Lateral 2	User association organized, initiation of functions (lateral not formally turned over). Junta formed.
Nov 88	Laterals 3,4,5	User associations organized, initiation of functions (lateral not formally turned over).
	Lateral 2	Lateral officially turned over to user association (Irrigation Association).
1988-89	Laterals 3,4,5	Laterals officially turned over to user associations.
	Laterals 1,6	User associations organized, initiation of functions (laterals not yet officially turned over).

TABLE 3

TRANSFER OF PRYN CONTRACT I LATERALS TO FARMERS

Date	Sector	Event
Dec 1986	Lateral 16.2, V. Gonzales	Initiation of user groups (nucleos). Initiation of functions.
Mid 1987	V. Gonzales, Bombeo	More nucleos organized. Associations formed. First laterals formally turned over.
Oct 1987	Contract I	Junta de Regantes formed.
Mid 1988	Santiago, Navarrete, Ponton	Nucleos organized. Santiago sector formally turned over.
Oct 1989	Contract I	Associations hold elections. New presidents, junta membership elected.
Jan 1990	Ponton, Navarrete	Sectors formally turned over.

functions by WUOs. Laterals 1 and 6 have not yet been officially turned over to their user associations.

PRYN Contract I

Table 3 indicates the dates for formal turnover of PRYN Contract I laterals to users, and the assumption by them of core functions.

IRRIGATION ORGANIZATIONS IN SANTIAGO AND AZUA

Different kinds of organizations can result from the turnover process. At one extreme, the WUO may be an extension of the government in the field: an enforcement body responsible for ensuring the discipline required for effective O&M. At the other, it may be a vehicle to promote the interests of its constituents. The former type of organization is likely to enjoy external support from the agency; the latter will have high levels of internal support. These different purposes have different require-ments in terms of organizational structure. Because the juntas depend for their survival on both internal and external support, organizational structure in YSURA and PRYN must reflect these two different ends. OFWMP staff have shown consider-able flexibility in experimenting with organizational forms that respond to both needs. However, as the different organi-zational models developed in both regions are tested, they will require some adjustment.

Levels of Organization

Irrigation organizations in PRYN Contract I and YSURA are nested. Organizational structures reflect the different physical shape of the systems as well as different land distribution patterns.

YSURA

The system is divided into six laterals of varying lengths. Table 4 indicates the wide variation in number of sectors, irrigator committees, and users on each of the six laterals. A number of turnouts feed unlined, informal networks of tertiary and quaternary canals.

TABLE 4

YSURA: LATERALS, NUMBER OF NUCLEOS, USERS, AND AREA

Lateral	Sectors	Tertiaries	Nucleos	Users	Area (hectares)
1	2	38	50	1051	3036
2*	1	44	42	1581	1998
3	1	6	6	83	251
4	1	18	17	391	905
5	1	22**	22	692	1472
6	1	39***	28	666	1578
Total	7			4464	9240

Source: OFWMP, Centro Sur 1988, 1989

* C. Cruz memo to files, August 5, 1988.
** Includes the incomplete prolongation, one pump system, and the old Rosario canal.
*** Seven tertiaries receive some water from pump systems that had existed prior to YSURA development. Of the 39 enumerated tertiaries, 19 are listed as having a length of 0 m. and no associated nucleo.

User organization is three-tiered:

(1) Junta de Regantes YSURA

- Board of Directors, elected by the General Assemble
- General Assembly consisting of members of the boards of directors of the Irrigator Associations for each sector[2]
- Employees and manager of the junta who is appointed by the Board.

(2) Irrigator Association for each sector
- Governing Board
- General Assembly consisting of all nucleo committee members

(3) Nucleo
- Committee of three members
  Member in charge of canal cleaning
  Ditchtender (honorary)
  Auxiliary
- Membership consisting of all users at a turnout.

PRYN Contract I

The Ulises Fco. Espaillat main canal, serving PRYN Contract I, runs roughly parallel to the Río Yaque del Norte. Its large number of short laterals and turnouts, some with but one user, necessitate a more complex organizational structure. Subsectors are generally organized at the lateral or sublateral level and range from 12-76 users and 66-281 hectares. They are an attempt to reduce complexity by consolidating user groups above the turnout or nucleo level. Table 5 contains information on the number of laterals, nucleos, users, and area in PRYN Contract I.

The water user organization in PRYN Contract I is four-tiered:

(1) Junta de Regantes PRYN Contract I
- Board of Directors (Junta Directiva), elected by the Sector Juntas Directivas
- Employees and manager of the junta who is appointed by the Board

(2) Sector
- Junta Directiva

(3) SubSector

(4) Nucleo
- Representatives
- Membership consisting of all users at a turnout.

TABLE 5

PRYN CONTRACT I: LATERALS, NUMBER OF NUCLEOS, USERS, AND AREA

Irrigation Sector	Sub-sectors	Nucleos	Users	Area
Ponton	5	29	206	794
Navarrete	7	36	202	927
V. Gonzalez	9	46	429	1407
Bombeo	7	38	429	1150
Santiago	5	25	210	911
Total	33	174	1474	5198

Source: INDRHI, Distrito de Riego Alto Yaque del Norte. Propuesta Resumen de Unidades Contrato I.

Organizational Functions

Most of the management functions of the systems are carried out by the Junta Directiva in conjunction with its administrative and technical staff. Generally speaking, the Junta Directiva is a policy-making body, although individual members tend to become involved in day-to-day management. The administrator, operations chief, technicians, and office staff of the junta do the daily chores and make decisions to carry out policies made by the Junta Directiva.

The juntas should restrict their activities, especially in their initial years, to a set of core functions to include:

- Irrigation system operations, including allocation and distribution of water to all users commencing at the lateral gate;

- Irrigation and drainage system maintenance;

- Business management, including budgeting, the collection of revenues (water fees), the control and programming of expenditures, and the keeping of records necessary for business management; and

- Provision of an organizational framework for system operations, rule enforcement, conflict resolution, and problem solving.

In connection with the latter function, the Junta Directiva is also expected to engage in the organization of consciousness-raising and educational activities.

The Juntas Directivas have shown interest in activities beyond core functions. Examples include marketing, credit, and agricultural extension. These activities are compelling and reflect legitimate and urgent farmer concerns. However, at least in the early and financially uncertain years, the evaluators recommend that the juntas generally avoid such activities because they will spread their limited financial resources and managerial capacity too thinly.

The Association is charged with routine maintenance at the lateral level. It schedules cleaning of the laterals, in which all nucleo members should participate, and acts as a forum for conflict resolution for members of different nucleos or where conflicts can not be handled by the nucleo representative or committee.

In YSURA, the nucleo is represented by a committee, a three-man body elected by nucleo members, which draws up and administers a schedule for water use based on farmer needs, operates the tertiary level gate, supervises canal cleaning, and resolves conflicts within the nucleo. In PRYN Contract I, these functions are vested in a single representative. Nucleo members are obligated to take water in turn, manage water properly on their parcels, maintain canals, serving their parcel, and participate in cleaning of the lateral, canals, and drains that serve the nucleo. Each irrigator pays his annual water assessment (set by the junta) directly to the junta.[3]

Representation and Equity

OFWMP has assisted the juntas to achieve equitable representation in their organizational structures. Nucleo and Association membership is by tertiary and canal command area. While this makes sense from a functional standpoint, it has resulted in some imbalances in representation and distribution of workloads. These are of particular concern in YSURA, where lateral size is uneven. The Junta Directiva has recently divided the longest lateral (which serves more than 1,000 users) into two sectors and is studying a proposal to change its structure at the Association level to equalize representation. PRYN has addressed this problem through creation of subsectors.

Representation is indirect and, therefore, dependent upon the ability of nucleo representatives and Association members to channel information from the base to the Junta Directiva, and to accurately transmit information about rules and procedures to nucleo members. The technical staff of the junta provide another channel for communication. Their role is especially important where the representative structure is new and committee members are still not fully aware of their governing duties.

Groups Represented

Head-enders and tail-enders. Representation and equity for tail-enders have improved significantly as a result of OFWMP. However, nucleo formation has not yet been completed on all laterals in Azua. For example, farmers toward the tail end of Lateral 6 are not organized in nucleos, nor do they pay water fees. The project has made an effort to couple farmer organization efforts with rehabilitation to maximize the likelihood of organizational viability. However, those farmers who are not yet receiving water reliably or who suffer from waterlogging and salinization are not generally nucleo members; they do not pay their quotas or participate in canal cleaning. Thus, those who suffer from more severe drainage problems are underrepresented.

Small farmers and large landowners. Because of OFWMP, small farmers are better represented and better served. By substituting local (honorary) ditchtenders nominated by their peers for the poorly paid and corruptible ditchtenders on the INDRHI payroll, the project has made giant strides toward achieving equitable water delivery. In the PRYN Contract I area, OFWMP sociologists were not aware of serious problems caused by the intermingling of small and large land holdings along a lateral. YSURA farmers reported initial resistance to farmer organization on the part of large landowners — particularly those near the head of the system. The junta has begun to deal firmly with individuals, large and small, that violate the rules,[4] and small farmers interviewed by the evaluators believe that water delivery was equitable in this regard.

Women. Women participate in irrigated agriculture in the project areas by transplanting and harvesting. As heads of households, they also irrigate and clean canals. Women share equally in the use of irrigation water for cooking, cleaning, bathing, and drinking, and therefore have a strong interest in water quality. At present, women are not formally represented in the YSURA Junta de Regantes. In PRYN Contract I, their participation is restricted to a few nucleos in Pontón. No members of the Pontón Sector Junta Directiva are women.

Intensity of Participation

Nucleos in both project areas were formed rapidly, and participation may be weak as a result. PRYN sociologists saw a need for further training to help farmers articulate their needs and interests as junta elections approach. A November 1989 diagnostic report by YSURA project staff concludes:

> Organization has been consolidated at the level of the Associations and the junta, but at the level of the irrigation committees, nucleos, and individual irrigators, we find lack of familiarity with the organization and lack of participation.

In a study of the level of participation of PRYN farmers in Junta de Regantes activities, Jerez (1988) found that while group membership rates are high (85 percent), 91 percent of group members were inactive. This view was corroborated by OFWMP sociologists in Santiago.

PROJECT ACHIEVEMENTS

Transfer of System Control and Responsibilities to Farmers

Responsibility for system O&M and fee collection has been transferred to the Juntas de Regantes in Santiago and Azua.

Irrigation Organization

- Organizations have succeeded in including large landowners, small, agrarian reform settlements, and private holdings.
- Junta Directiva members exhibit confidence in their ability to manage their own affairs, manifested in their eagerness to take on additional functions and in their promotion efforts in other areas.
- Democratic elections of Association representatives and the Junta Directivas have taken place.
- The Junta Directiva for YSURA has successfully imposed sanctions to prevent illegal use of water and destruction of infrastructure.

Equitable Water Delivery

When evaluators asked a group of farmers what they thought was OFWMP's most important accomplishment, they responded, "the end to the sale of water." Before the project, they reported, INDRHI ditchtenders sold water to those who could afford to pay. Ballard (1985: 66), reporting on this problem, argued that

> INDRHI's central problem in this situation is that it lacks the resources, especially manpower and vehicles, to regulate effectively or 'police' water use on the farm. The water distributors who are responsible for opening the canal gates are underpaid and therefore subject to bribery, often do not have vehicles, and have large areas to cover each day . . . . Given the circumstances just described, and the probability that training is insufficient, it is acknowledged that the cabos do not do an adequate job. In general it can be said that INDRHI control over water stops after the water leaves the lateral canals.

This view was corroborated by nearly every farmer visited by the evaluators. Despite an adequate water supply, farmers in the middle and tail reaches of laterals often found themselves unable to cultivate for lack of water, while water users at the head end and those who could pay to assure a supply to their fields often overwatered their crops.

The decision to sidestep the INDRHI ditchtenders, and to delegate their functions to honorary ditchtenders selected by their peers, vastly increased equity and efficiency in water delivery and expanded area under cultivation in each system. It also did much to generate support for turnover and for the Junta Directiva. Achieving more orderly and equitable water deliveries was OFWMP's pivotal accomplishment and one which permitted user organizations to take hold.

Fee Collection From a Larger Number of Farmers

Due to better water deliveries as a result of the project, an increased number of farmers are paying water fees. In 1988/89, fees were collected from 75 and 60 percent of the farmers in YSURA and PRYN Contract I, respectively.

Land Redistribution

Farmers in YSURA organized to redraft their property lines to better coincide with the water delivery system. Some holdings were consolidated, others were traded. The tendency among farmers was to form single farm units rather than to have several smaller holdings. Land redistribution was accomplished rapidly and without fanfare or conflict.

Conflict Management

By ensuring more equitable water delivery, the Juntas de Regantes have been able to reduce levels of conflict in the project areas. This job is made easier by the fact that water supplies are ample. In addition, mechanisms exist within the project areas for management of conflicts that do arise. The nucleo, Association, and the general assembly of the junta are forums for airing and resolving conflicts. In YSURA, the evaluators found that junta staff play a key role in facilitating conflict management by reminding farmers that these forums exist and by helping them set up meetings to resolve disputes. The presence of junta technicians in the field in and of itself did much to reduce tension and create a favorable environment for problem solving.[5]

Diffusion of Innovation

Farmers in other irrigated areas, notably Dajabon, have begun their own efforts to install irrigation organizations. Farmers in the PRYN Contract II area who have not benefitted from OFWMP interventions expressed a strong interest in WUO formation. Junta members in Azua and Santiago participate in workshops to promote junta formation in other regions. Spreading the organizational message to water users in other irrigation systems in the country is part of the survival strategy of the existing juntas.

FACTORS AFFECTING ORGANIZATIONAL VIABILITY

Organizational viability of the juntas depends on inside and outside support. **Inside support** means that the juntas must draw upon the continued support of their members if they are to survive. **Outside support** deals with the context or environment in which the juntas operate.

Inside Support

Water Delivery to Existing Service Areas

Timely and adequate water delivery to users in all parts of the irrigation system is the sine qua non for junta viability. Farmers will continue to pay fees only if water service meets their needs. Water delivery depends upon adequate O&M. A lack of attention to maintenance, as reflected in budgets and attitude, is likely to be of critical importance in the next few years. Junta budgets are insufficient to cover the costs of system and equipment maintenance and repair (Chapter Six). Moreover, so far as maintenance is concerned, junta management appears to reflect the style and priorities set by INDRHI: maintenance is a function that will be performed only if residual funds remain.

Water Delivery to Areas not Yet Rehabilitated

The revenue base for juntas will be increased if areas not adequately served receive water deliveries (for example, Lateral 6 in Azua). OFWMP can assist the juntas by putting a priority on rehabilitating these areas.

Responsiveness to Farmer Needs

The viability of the juntas and their ability to perform their functions rest on an ability to represent the broad interests of the community of irrigators and to respond adequately to their needs. Do organizations at all levels adequately represent interests of members of the community of irrigators?

Gender. The project paper calls attention to the invisibility of women in Dominican agriculture and cites the need to "attend to the rights of women farmers to have a voice in the water users associations that are formed" (Project paper, 50). Except in Ponton (PRYN Contract I), where the overwhelming majority of irrigators in several nucleos belongs to a women's agrarian reform settlement, women are not represented in the junta, and their impact on junta decision making is not apparent.

Location. Emphasis on pilot areas has resulted in neglect of rehabilitation, drainage, and organizational formation in other laterals. The YSURA tail-enders who bear the brunt of drainage and salinity caused by overirrigation are the least likely to be members of active nucleos.

Functional Specialization or Diversification

The team noted a tendency for the juntas in both irrigation systems to look beyond their mandate to other functions. Overextension of their functions is natural in view of the juntas' advocacy role and the fact that irrigated agriculture is an integrated activity of which water management is only one part. Alternative sources of support for other aspects of agricultural production (such as extension and pest management), credit, and marketing are largely absent in Azua, where there is a general institutional vacuum at the local level. To maintain support from constituents, the juntas may take on more functions than they can effectively manage.[6]

Junta-Farmer Communication

According to Burroughs (1987), many problems that occurred were due to the lack of adequate communication between the junta, Associations, nucleos, and water users. Many water users are still unaware of norms and procedures. Despite the fact that they were informed in writing about the directives of the junta, the evaluators found that there is still considerable confusion about water user responsibilities and the application of sanctions.

The evaluators found that the junta technicians are the main link between farmers and the junta. Team members followed technicians in the YSURA and PRYN Contract I systems in their daily work, operating the system and talking to farmers about their problems. Farmers felt free to lodge complaints with the technicians, who appeared to enjoy good rapport with the farmers. The ability of YSURA junta technicians to create an environment for productive discussion and dispute resolution was impressive. As long as succeeding generations of technicians are equally well trained and skilled, channels for effective junta-farmer communication should remain open.

Outside Support

Legal Status

Formal structure and a legal mandate are essential for the juntas to obtain the administrative and political clout needed to represent the farmers' interests effectively. While the existing water law provides for formation of Juntas de Regantes, it neither guarantees them juridical standing nor authorizes them to collect fees and impose sanctions. At present, they operate at the discretion of the President of the Dominican Republic and the Director of INDRHI. One reason that Junta Directiva members are actively promoting junta formation in other zones and districts is to increase their political clout in the face of institutional and legal uncertainty.

The Azua junta is beginning to show its muscle at the national level on behalf of the farmers. However, its continuing ability to represent them will depend on formalization of its authority to manage the system, collect fees, and impose sanctions. A 1989 seminar sponsored by INDRHI, OFWMP, the Instituto Agrario Dominicano (ISA), and the Centro de Administración des Desarrollo Rural (CADER), supported by USAID, produced a proposal for revision of the Dominican water law in ways that would strengthen the juntas. These revisions have been presented to legislators at the national level, but have not been introduced. The evaluators recommend that USAID make future assistance to the Dominican irrigation sector contingent upon enactment of legislation authorizing these changes.

Clear Definition of INDRHI and Junta de Regantes Functions and Responsibilities

At a January 1990 ceremony in Mao in which President Balaguer officially transferred the Ponton

and Navarrete sectors of the PRYN Contract I system to the farmers, OFWMP and junta officials presented a formal agreement delineating continuing INDRHI responsibilities on the one hand and junta responsibilities on the other. This document is a good start in this direction. It awaits the INDRHI director's signature. Our recommendations for the INDRHI-Junta division of responsibilities is discussed in Chapter Seven.

Support to the Juntas

USAID should continue to support the juntas. Before the project ends, the two juntas will need the following forms of direct OFWMP assistance:

- Completion or rehabilitation of major irrigation and drainage works, particularly drainage works for Lateral 6 and downstream portions of Lateral 1 in the YSURA system (Chapter Three);

- Direct financial assistance (matching funds) for a fixed period to be used exclusively for maintenance and repair of facilities and equipment or for equipment rental (Chapter Six); and

- Delivery of heavy equipment currently promised to juntas as part of the project (Chapter Eight).

Recommendations for technical assistance support in specified areas is given in Chapter Eight.

USAID Presence

Apart from direct financial assistance, the evaluation team believes that continued USAID interest in the juntas is an additional element of outside support that will strengthen junta viability. GODR agencies, particularly INDRHI, recognize the role that the U.S. government has played in facilitating junta establishment. Continued interest by the Mission will send signals to the GODR that the process started by OFWMP is one that the U.S. government would like to see continued. This may in part protect the juntas as they struggle for survival. Interest can be manifest in many ways: periodic visits by Mission staff; encouragement for monitoring progress of juntas and turnover; and sponsorship of domestic and international visits, seminars, and workshops to help publicize OFWMP organizational achievements.

INSTITUTIONAL COORDINATION

INDRHI-Junta Coordination

Coordination between INDRHI and the juntas has been generally good. It is mediated by (1) former INDRHI employees on the junta administrative staffs and (2) OFWMP staff who enjoy a close working relationship with junta members. After the project ends, OFWMP staff will be reassigned, and future junta employees may not be drawn from their ranks. More direct coordination between the junta and INDRHI staffs will be required. Junta coordination with INDRHI district personnel is virtually absent.

Junta-Farmer Coordination

Farmers will be more supportive of junta decisions and more willing to pay increased water fees if they know where and how their money is being spent and if they have played some role in these decisions. Therefore, active participation in formulating budgetary priorities will be a prerequisite for continuing junta viability. As a first step in the budgetary process, nucleos should meet to identify and prioritize their needs (diagnostic analysis). In a second step, the junta should return to the nucleos with an allocation plan based on identified needs and resources available. This plan would be based on a similar diagnostic analysis process at the system level. Thus, interested nucleo members would share

with the junta and its staff the hard choices about where to spend scarce resources.

Interinstitutional Coordination

Junta viability is in large part a function of the willingness of members to pay for services and to cooperate in cleaning and efficient water use at the farm level. This willingness in turn depends on the continued productivity of agriculture and returns to the farmer. Productivity is a function not only of water management, but of crop choices, pest control practices, credit, markets, and policies. Thus, the success of turnover in the Dominican Republic depends not only on the strengthening of the internal capacity of irrigation organizations to manage the parts of irrigation systems under their control, but on effective collaboration among public and private sector agricultural institutions to enhance the sustainability of irrigated agriculture and its returns to farmers. In the past, such efforts have met with little success, but several new efforts underway may hold promise.

- The PRYN Junta Directiva recently prepared a proposal, in collaboration with regional offices of SEA, IAD, BAGRICOLA, INDRHI, OFWMP, the Instituto del Tabaco, the Centro Norte Desarrollo Agropecuario, and the Instituto Nacional Estabilización de Precios, for coordinated activities in support of irrigated agriculture in the junta's area of influence.

- A National effort promoted by the YSURA and PRYN juntas is the Sistema Nacional Autogestionario de Produccion Bajo Riego (SINAPBRI). SINAPBRI would be engaged in improvement of administration and O&M of irrigation infrastructure; natural resource and environmental conservation; development of more just and viable forms of agricultural production; and improvement of the quality of life within the irrigator communities.

- A SEA effort, the Programa Nacional de Apoyo de la Agricultura Bajo Riego, is directed at provision of technical assistance, agricultural inputs, credit, and marketing services appropriate for irrigated zones.

No attempt has been made to assess the potential benefits of these proposed programs, but it should be noted that the development of coordinated agricultural and rural development efforts outside of the juntas is a necessary corollary to functional specialization within it. OFWMP and INDRHI should continue to support such collaborative efforts rather than attempt to absorb peripheral functions.

SUMMARY

OFWMP has made possible the transfer of irrigation system management from INDRHI to organized groups of farmers in the YSURA and PRYN Contract I systems. These Juntas de Regantes are broadly based, representative groups that ensure equitable water delivery, collect fees, manage conflict, and reduce violations of system rules. By substituting volunteer ditchtenders nominated by their peers for the poorly paid and corruptible ditchtenders on the INDRHI payroll, the project has made giant strides toward achieving equitable water delivery and generating internal support for turnover. Farmers are taking steps to replicate these organizations in other regions of the Dominican Republic.

Organizational forms differ somewhat in the two regions, but represent a compromise between the need to manage the systems efficiently and the need to ensure that all water users in the systems are adequately represented. Structures are in place for participation down to the nucleo level in most parts of the two systems and the juntas enjoy widespread support, but participation at the base needs to be strengthened. One recommended way to do this is for the project to complete portions of the drainage

system in YSURA and in that way provide incentive for those farmers to join the junta.

In their initial years, juntas should concentrate their resources on a core set of functions and not engage in activities peripheral to these functions.

When farmer livelihood depends on irrigated agriculture, the farmers have a powerful incentive to see that the system is well managed. However, their continued participation and support for the juntas may depend on the extent to which they can realize increased well being as a result of their efforts. Also, although the irrigation organizations in Santiago and Azua hold considerable promise, they are young and still dependent upon outside support in terms of legal status, institutional collaboration, and human and financial resources. This outside support is needed to build the inside support that is a prerequisite for junta survival.

USAID should make future support to INDRHI dependent upon the enactment of GODR legislation to legally empower the juntas.

NOTES

1. A YSURA junta director was particularly pleased to tell us that he had learned to operate a backhoe as part of his training.

2. Each of the six laterals in the YSURA system comprises a sector, with the exception of the extremely long and populous lateral 1, which is now divided into two sectors.

3. This is a recent change in Azua. Until last year, water fees were included in Banco Agricola and contractor loan packages to farmers and were paid to the Junta Directiva by the lender.

4. The YSURA Junta Directiva has retained a lawyer to help prosecute violators. Junta technicians have persevered in replacing locks and cutting off violators' water supplies, no matter how important the offending landowner.

5. In the course of assessing Azua technicians' interactions with farmers in the field, evaluation team members observed several conflicts that were managed through an appeal to process. Rather than acting as judges, the technicians facilitated the organization of a meeting to resolve the problems. As farmer attention turned to creation of an environment for dispute resolution, tensions eased visibly.

6. Lusk (1988) makes this observation. The team found similar tendencies when talking with members of the YSURA Junta Directiva about future needs.

6

FINANCIAL CONSIDERATIONS IN THE TWO JUNTAS

This Chapter considers the collection of user fees in relation to junta expenditures. Comparisons are made between junta expenditures and those by INDRHI. Lastly, the viability of junta operations and continuing assistance needs are discussed.

COLLECTION OF WATER FEES

Tables 6 and 7 for YSURA and PRYN Contract I, respectively, indicate the number of irrigators paying water fees, the area for which water fees were paid, and the total amount of fees collected.

Examination of crop production costs for a variety of crops and from a variety of sources indicates that water costs are very small — as little as .05 percent — in relation to total production costs for virtually all crops produced in the two areas.

YSURA

The current water fee is RD$ 57.24 per hectare (RD$ 3.60 per tarea) per year, irrespective of the amount of water taken or crop produced. The fee is doubled for all areas greater than 10 hectares in a single property. The water fee in the rest of the YSURA district, the part operated by INDRHI rather than the junta, is RD$ 24.64 per hectare (RD$ 1.55 per tarea) per year.

In 1988/89, 3,375 of 4,464 farmers in YSURA paid fees, or 75.6 percent. In that same year, water fees were paid on 5,426 of 9,244 hectares irrigated, or 58.7 percent. It was informally estimated that about 10 percent of total assessments were paid in 1985 (against a RD$ 1.55 fee level). The evaluators believe that fee collection, as measured by number of farmers paying, is a positive indicator of junta performance, particularly since junta operations have been underway for just over two years. Junta operations started in late 1987 on just one lateral. Two laterals have been recently, and still informally, organized.

TABLE 6

WATER USER FEES PAID - YSURA

1980-1989 Year	Farmers Paying	Hectares Paying RD$	Collected
1980			29,786
1981			28,896
1982			24,442
1983			61,080
1984			75,604
1985			117,914
1987-88	1,889	3,375	212,924
1988-89	3,375	5,426	339,325
1989-90	1,441	2,455	140,124*

* Collections are for only two months and 19 days of FY 1989/90.

Sources: 1980 to 1985 INDRHI records from Chapman (1987). 1987/88 to 1989/90, YSURA junta records.

While a record RD$ 339,325 was collected by the junta in 1988/89, total fee collection trends are difficult to judge from the collection totals. Prior to 1984, inflation ran less than 10 percent per year. The inflation rate between 1984 and 1989 was between 25 and 60 percent per year. In that five-year period, the cumulative rate of inflation of the peso was 544 percent.[1] It would appear that junta collections in 1988/89 were inferior in real terms to INDRHI collections in 1985. As just two months of 1989/90 have elapsed, junta collections may or may not be running ahead of the 1988/89 totals.

PRYN Contract I

The current water fee for crops other than rice is RD$ 3.57 per tarea per year, double that if rice is grown,[2] and double the fee if more than 10 hectares are produced. Rates were last raised in 1987.

In 1988/89, 882 of 1,473 farmers, or 60 percent, paid fees. In that same year, water fees were paid on 2,850 of 5,200 hectares, or 55 percent of the irrigable area.

Fee collections totaled RD$ 237,781 in 1988/89. Because the two areas presented in Table 7 are not the same, and because of inflation, trends in fee collection are difficult to detect in fee collection figures. Nevertheless, at least one observer believes that there has been considerable improvement in fee collection over earlier years (Sanchez 1989). The evaluators consider Santiago junta performance against fee collection measures less impressive than in Azua.

Examination of fees paid monthly indicates that fee payment is not constant through the year, but instead varies (Sanchez 1988a). The payment of fees may differ markedly by tenure type and farm size, with large private landowners, users who take bank credit, or those who grow on contract[3] tending to pay more regularly and promptly than small farmers and land reform beneficiaries. Some farmers choose to wait until water is needed to pay their fees. Farmers under marketing contracts may be able to pay fees only when their crop is marketed. Fee payment patterns and consequently cash flow, affect junta viability and must be taken into account by the juntas. Juntas must take steps to build cash reserves of operating capital to cover costs during seasonal periods of low income.

TABLE 7

WATER USER FEES PAID - PRYN AREA

1981-1989

Year	Farmers Paying	Hectares Paying RD$	Collected
1981-1989			
Distrito de Riego Alto Yaque del Norte*			
1981			147,917
1982			140,422
1983			108,883
1984			199,091
1985			358,644
PRYN Contract I**			
1987-88	774	2,485	188,044
1988-89	882	2,850	237,781
1989-90	303	1,105	91,629***

* Alto Yaque covers 38,000 hectares including what is now PRYN Contract I.
** PRYN Contract I covers 5,200 hectares.
*** Collections are only for two months (Nov and Dec 1989).

Sources: 1981 to 1985 INDRHI records for Alto Yaque from Chapman, 1987.
1987/88 to 1989/90 PRYN Contract I Junta records.

JUNTA EXPENDITURES

According to the managers of the two juntas, operations (largely staff salaries) are financed entirely from water user fees. Both juntas received significant assistance from OFWMP in the form of staff, equipment, and machinery.

YSURA

Projected expenditures are in four budget lines: Administration, Canal Operation, Repair and Maintenance, and Other, as indicated in Table 8.

TABLE 8

JUNTA EXPENDITURES - YSURA

(RD$ Projections)

Item	1988/89	1989/90
Administration	253,100	111,649
Canal Operation	24,340	158,178
Repair and Maintenance	237,300	425,500
Other	3,600	67,532
Totals	518,340	762,859

Source: Junta Manager, YSURA.

Budget projections exceeded fees collected by almost RD$ 180,000 in 1988/89. A shortfall of a similar magnitude is anticipated in 1989/90. The 1988/89 and 1989/90 figures are not directly comparable. Some personnel and vehicle costs associated with the junta technical staff are included in the 1988/89 category of Administration. In 1989/90 they are shown under Canal Operation and Repair and Maintenance. Also, the 1989/90 category of Other includes a 5 percent contingency item against the total budget. Contingencies were not included in the 1988/89 budget.

Projections for operation, repair, and maintenance appear reasonable in relation to those for administration, staff, and vehicles. The junta has about 20 total employees, including technical staff, four "helpers," a secretary, and a janitor.

Evaluators note with favor an amortization item (not shown in Table 8) in the YSURA repair and maintenance line. This is intended as a sinking fund for equipment that the junta would like to purchase. It is noted elsewhere that the juntas must begin to set aside cash reserves in a sinking fund in anticipation of expenditures certain to occur for major repairs and for replacement of equipment.

Operation, plus repair and maintenance, constituted 50.5 percent of total budget projections in 1988/89, when no office, vehicle, or personnel costs were included in these three categories (Anderson, 1989), and 80.3 percent of total budget projections for 1989/90 when the costs for personnel and vehicles necessary to these functions are included in these budget lines. However, according to the YSURA Junta Directiva members and manager, essentially all of the budget shortfall, the RD$ 180,000 budgeted but not collected in 1988/89, is made up by deferring expenditures for repair and maintenance. This was precisely the policy followed by INDRHI, and one that resulted in gross deterioration of the irrigation systems. The evaluators consider this shortsighted. Repairs and regular maintenance must be done to ensure water deliveries and continuation by users of payment of fees and of other support.

PRYN Contract I

Expenditures for PRYN Contract I are projected in four budget lines: Administration, Canal Operation, Repair and Maintenance, and Other, as shown in Table 9.

Projections for the two years are directly comparable, in that the same items are included in each of the four budget lines for both years. In 1989/90, the Santiago junta had 14 employees, nine in technical categories and five in support roles. Projections for O&M were 30 percent of the total budget in 1988/89 and are 23 percent in 1989/90.

In 1988/89, the PRYN junta collected 83 percent of its projected budget, leaving a shortfall of just RD$ 48,700. If the junta succeeds in raising the number of irrigators paying fees beyond 60 percent, or if the percentage of the area on which fees are collected goes beyond 55 percent, there may be no current shortfall.

TABLE 9

JUNTA EXPENDITURES - PRYN CONTRACT

(RD$ Projections)

Item	1988/89	1989/90
Administration[4]	198,791	287,094
Canal Operation	2,350	3,240
Repair and Maintenance	84,100	83,600
Other	1,200	--
Totals	286,441	373,934

Source: Junta manager, PRYN Contract I.

The evaluators believe that expenditures for repair and maintenance must be substantially increased if the junta is to retain credibility with members. This will become critical when OFWMP ends. In a system with 25 laterals and 5,200 hectares under irrigation, a line item of about RD$ 84,000 is not enough, no matter how complete or new the system. Further, there is no budget item for repairs to and replacement of equipment.

COMPARISON BETWEEN JUNTA AND INDRHI COLLECTIONS AND EXPENDITURES

Sanchez (1989) states that annual junta administrative expenditures in 1988/89 were only about one-fifth of annual INDRHI levels before 1985. Sanchez also indicates that, during the early 1980s, INDRHI never collected more than 29 percent of its administrative budget from water fees. INDRHI directors told the evaluation team that only 12 percent of agency operating costs were derived from water users. Thus, the GODR subsidy for irrigation system O&M was 88 percent.[5] The evaluation team did not analyze these data, and we feel that the figures must be interpreted with caution.

It is our understanding that fees paid to juntas are at least twice as high as those of any other INDRHI-operated area in the DR. In comparison to INDRHI's operations in adjacent areas, the juntas are collecting more money per unit area served and from a larger number of farmers. Although water fees set and collected by the two juntas are two to four times higher than before turnover, because of inflation this does not represent a real increase.

According to a former INDRHI regional director, in 1989 his office budgeted RD$ 11 million for O&M for 27,000 hectares. But he received only RD$ 750,000, 63 percent of which went to equipment maintenance. If these figures are accurate, 1989 expenditures for O&M by INDRHI are on the order of RD$ 28 per hectare. By way of comparison, the 1988/89 junta expenditures for O&M in YSURA and PRYN Contract I ran RD$ 29 and 17 per hectare, respectively. One may compare these figures with those provided by the World Bank (1986: Annex 6, Volume II, page 216) citing the INDRHI Annual Report for 1981. O&M costs (1981) per that report are in the range RD$ 4-35 per hectare. Considering inflation, this comparison indicates that the juntas are actually programming lower real levels for O&M than did INDRHI.

Part of the problem here is that the evaluation team was not asked to do a detailed analysis of the budget figures. This must be done to make a correct comparison of budgets from different organizations. We recommend that project TA funds be allocated to (1) continue to assist the juntas to formulate their budgets and (2) increase junta awareness of the need to allocate sufficient

funds for repair and maintenance. Financial and business management is an area where the juntas would benefit from TA.

In the past, rehabilitation and maintenance (it is sometimes difficult to separate the two) were done by the project and, to a lesser extent, by INDRHI. We asked the juntas how they would do rehabilitation and maintenance in view of budgetary shortfalls and impending project termination. By deferring maintenance, was the response. We do not believe that the juntas are prepared to raise water fee collections to cover needed repairs and maintenance or the shortfall in expenses. Nor are increases of the magnitude that will be required when OFWMP ends likely to be accepted by users. Both junta managers stated that small yearly increases are much more palatable than large, one-shot type increases. It may take several years for juntas to increase the level of the fees, the number of users who pay fees, and the number of hectares from which fees are collected, to the point where revenues cover needed expenditures.

FINANCIAL VIABILITY AND CONTINUING ASSISTANCE

It is not a junta responsibility to rehabilitate the irrigation systems. We assume systems will be turned over in fully rehabilitated, good working order. Our discussion of junta viability is directed not to rehabilitation but rather to junta ability to support core functions. Beyond the rehabilitation and new construction in the two project areas, OFWMP, and INDRHI, have made significant resources available to the juntas. Resources have included:

- Staff support, particularly in operations and water distribution, data collection, and training and user organization;
- Donation, repair, and maintenance of: vehicles (pickups and motorcycles); machinery and equipment for the field, (graders, tire-mounted back hoe/front end loaders); and office equipment (computers, furniture, radios); and
- Services provided by heavy machinery.

Once OFWMP ends, these resources will be missed. We expect current levels of operations in PRYN Contract I and in YSURA to decline once OFWMP-provided resources end, because the juntas are not able to allocate sufficient resources to maintenance. Inability to maintain the systems will lead to breakdowns in water delivery and to an erosion of user support to juntas.

Although inevitable, user fee increases are not the near-term answer. The evaluators question whether any fee increase that would be supported (paid) by users would be enough to cover the costs of maintaining and replacing present equipment.

The conclusion is that the juntas will need limited support for a delimited time. The rehabilitation and new construction financed under OFWMP must be completed before systems are transferred. This is a project and not a junta responsibility. Thereafter, financial support should end gradually, over a period not to exceed three years. We recommend that the project provide limited financial support (in local currency) to the two juntas under these conditions:

- Support would be only for irrigation and drainage facilities repair and maintenance, or for equipment replacement or rental;
- Support would be provided under an arrangement whereby the juntas match funds contributed by USAID. Details about the arrangement (the degree of match, how the funds are banked and used) should be worked out between the two parties; and
- Support would be for a maximum of three years.

In addition to financial support, the juntas will require transfer of certain heavy equipment items. This process is currently underway.

SUMMARY

The juntas have been successful in obtaining water fee payment from a large and increasing number of users. However, considering inflation, the juntas actually may be collecting less in real terms than did INDRHI in the first half of the 1980s.

Collection levels for PRYN Contract I are nearly sufficient to meet junta budgeted expenditures. Collection levels in Azua are insufficient to meet the 1989/90 budget.

In neither system are projected junta revenues or programmed levels of O&M expenditures sufficient to undertake routine maintenance, or to build capital reserves. Nor is there evidence that the juntas will make these priority needs. With systems mostly rehabilitated, the juntas may be able to maintain current levels of operations for a year or two. However, eventually, failure to maintain the systems will lead to an inability to deliver water and an erosion of user support to juntas.

There is reason to doubt the current ability of the juntas to increase collections to cover necessary levels of O&M expenditures. Consequently, we recommend limited continued support to juntas for up to three years with (matching) funds to be earmarked only for repairs and maintenance to equipment and facilities.

NOTES

1. Yearly figures were: 1985, 37.5 percent; 1986, 37 percent; 1987, 25 percent; 1988, 44.4 percent; and 1989, 60 percent. During the same time period, the rate of exchange of the peso against the dollar went from 2.13 to 6.28.

2. In PRYN Contract I, rice production is severely restricted to a few areas where soils are poorly drained and too wet for other crops.

3. There has been a major change in payment practice since 1989 in YSURA. The Junta Directiva is asking farmers to pay fees directly to the junta. Fees are no longer to be paid by the lending institution (Banco Agricola or agribusiness). Before 1989, the biggest laggards in fee payment were certain agribusiness companies.

4. Office equipment, personnel, vehicle costs, and other administrative costs.

5. World Bank, 1986, Volume II, Annex 6, page 199 states that for 1980-1984, 80-90 percent of O&M costs were being subsidized because collections from users represented only 10-15 percent of annual O&M expenditures.

7

INDRHI, TURNOVER, AND TRAINING

TURNOVER OF IRRIGATION SYSTEMS TO WATER USERS

Turnover of irrigation system management to water users may involve the transfer of responsibilities, the transfer of authority and control, or the transfer of property rights. In Azua and Santiago, ownership of irrigation infrastructure above the farm outlet rests with the GODR under the stewardship of INDRHI. Authority to allocate and distribute water lies with INDRHI, which delegated its authority below the lateral turnout to the Juntas de Regantes in the two project areas by means of formal agreements signed by the director of INDRHI and the Presidents of the Juntas de Regantes. Water is granted to farmers as a use right that can be reassigned. The Azua junta charter lists as a junta function the imposition of sanctions on those who misuse water by cutting off their supply, but according to the national water law, authority to impose sanctions for water theft and infrastructure vandalism rests with INDRHI district water tribunals. Finally, INDRHI has delegated to the two juntas its authority to collect user fees and to spend these fees on system O&M.

A Turnover Chronology

In 1982, INDRHI prepared a study of why and how transfers of O&M responsibility might take place.[1] The basic concepts presented in that study were incorporated into regulations promulgated by INDRHI in 1984 that established the form of WUOs at all levels, from local to national.

INDRHI began to implement a turnover strategy in 1984 with the publication of pamphlets and their distribution to farmers in irrigated areas.[2] As a result of this publicity and a strong organizing effort on the part of district and zone staff, INDRHI was able, in the fall of 1985 and the spring of 1986, to install directors and officers for most of the zone- and district-level groups. Most of the directors and officers formally installed were selected by INDRHI, rather than elected by their peers. As a result, these groups were not representative, and, lacking input from the lower levels, they faded out of existence in a short time. However, the local-level interest in organization was established and provided a basis for later efforts.

INDRHI's motivation for transfer was not budgetary, unlike the situation in other countries which have turned over portions of systems to users (the Philippines) or which are contemplating doing so (Indonesia and Pakistan). INDRHI considered transfer of systems to water users because the lower portions of the irrigation systems were in disrepair, water supplies to tail-enders were unreliable and sometimes nonexistent, and farmer dissatisfaction common.

Before the inception of OFWMP, YSURA was one of the worst-functioning irrigation systems in

the country. For both YSURA and for PRYN Contract I, OFWMP combined major rehabilitation of physical works with efforts at farmer organization that together enabled turnover to succeed.

OFWMP resulted in replacement of politically appointed ditchtenders by employees of the juntas. Prior to the junta, INDRHI employed 30 ditchtenders, a job now being done by just six junta *tecnicos*. These positions, pre-junta, were held by nonfunctioning political appointees, rather than actual working INDRHI employees.[3] Within INDRHI, there does not appear to be concern about the loss in Azua and Santiago of zone-level ditchtender positions. However, if turnover is to be applied in systems throughout the country, INDRHI might experience a loss in the number of professional staff and a budget reduction — changes that may not be accepted easily by the agency.

In a climate of austerity, turnover has provided INDRHI with a graceful way to reduce its responsibilities and relieve itself of management burdens. Burroughs has suggested that INDRHI would benefit from the

> administrative and financial autonomy of the user associations and their independence of state institutions. Given that the users manage their own system and impose water fees, a better response on their part in payment for water services is anticipated. It is also hoped that the costs of operation, administration, and conservation of the systems will be reduced (1987:14).

Privatization was USAID's reason to advocate turnover, but it is not a concept which the INDRHI bureaucracy can be expected to embrace. However, certain factors combined to support it. First, the irrigation systems were not functioning well and farmer dissatisfaction was widespread. Second, as indicated above, farmers had been organized previously, which facilitated later organizational efforts. Third, in 1986, the INDRHI Executive Director was a technocrat without vested ties to the agency. Apparently, he was a person who was more concerned with improving the irrigation systems than with perpetuating bureaucratic power.[4] Fourth, the President of the country, Joaquin Balaguer, aligned himself behind the turnover concept and he has officiated at each of the formal turnover events.

In interviews with professionals and executive-level INDRHI officials, we listened to the current position in support of turnover. All officials expressed willingness to continue the turnover process. However, it is too early to tell how firm this support is and whether it will continue (1) if the agency budget is threatened or (2) when USAID support for OFWMP ceases. USAID may wish to condition future support to INDRHI on establishment of a timetable for turnover of other irrigation systems.

INDRHI - JUNTA DIVISION OF RESPONSIBILITY

There is no authority in law for the organization of WUOs independent of INDRHI; rather, user groups may be formed pursuant to decrees, rules, and regulations promulgated by INDRHI. Therefore, WUOs are precarious. Future decrees from a government with a different political orientation might undermine or eliminate them.

Inasmuch as the juntas are new, the division of responsibilities between INDRHI and the juntas has not yet evolved. The division of responsibility needs to be clearly established. The evaluation team recommends a division of responsibilities along these lines:

- INDRHI would operate and maintain the main system (reservoirs, diversion works, and main

canals) to provide the appropriate amount of water to the head of each lateral, as requested by the junta;

- Juntas would operate and maintain the distribution system, commencing at the heads of each lateral;

- Juntas would maintain those drainage channels and facilities relating principally to agricultural waste and drain water; and

- INDRHI would maintain those drainage channels and facilities relating principally to the conveyance of storm and flood waters.

CHANGES IN TECHNICAL ORIENTATION

During the 1980s, INDRHI's work shifted from construction of facilities to water management. Evidence of the shift is shown in Table 10 and Figure 2, which compare categories of INDRHI professional staff for 1983, 1986, and 1989. Between 1883 and 1989 there was a dramatic reduction in numbers of civil engineers (-35) and surveyors/cartographers (-68), and a dramatic increase in agronomists (+118).

Staffing shifts within INDRHI may be due to reduced opportunities for new project construction. They may also be due to OFWMP, which has a cadre of 50 INDRHI professionals. The majority of OFWMP professionals are agronomists. But agronomists also serve INDRHI in non-OFWMP slots as head of zones or districts. It is unclear whether the staff changes within INDRHI reflect a genuine change in technical orientation within the agency.[5] If so, the project may be credited with helping to bring the change about.

The evaluation team considers OFWMP staff continuity one of the principal reasons for project success in facilitating turnover. Several INDRHI professionals assigned to OFWMP in leadership positions have served with the project since its initiation. However, during the last week the evaluation team was in the Dominican Republic (February 1990), INDRHI's Executive Director replaced or relieved the three top OFWMP directors. OFWMP professional staff showed their solidarity with their former OFWMP leaders and most walked off their jobs in protest. Relieved staff were later taken back into INDRHI but they are no longer in leadership positions with OFWMP. This series of events is unfortunate because the changes had a negative effect on staff morale, and project progress was slowed. The evaluation team believes that experienced leadership is an INDRHI asset that can and should be used in the future to facilitate turnover in other irrigation systems.

TRAINING

The project provided training to INDRHI staff assigned to OFWMP and to staff assigned elsewhere within the agency. It also provided training for junta staff and for farmers.

Professional Training

Table 11 shows the agency affiliation and the type of individuals that received training under OFWMP. The project provided three types of formal training opportunities for professionals:

- Masters level: 25 people received degrees in the United States (17) or in Mexico (8). All of them returned to the Dominican Republic. Most continued to work with INDRHI or the project. Most received additional on-the-job training in the project areas with members of the technical assistance team;

- Out-of-country short courses were provided to 122 professionals working with INDRHI or the juntas; and

TABLE 10

INDRHI PROFESSIONAL STAFF

	Number of Staff		
	1983	1986	1989
Civil Engineers	151	122	116
Agronomists	13	65	131
Business/Financial Administrators	23	19	43
Topographers/Surveyors	48	0	0
Electrical/Mechanical Engineers	1	13	14
Cartographers	20	0	0
Laboratory Specialists	21	0	2
Architects	4	1	5
Economists	5	5	8
Lawyers	3	5	2
Sociologists	1	1	1
Geologists	0	6	2
Chemists	0	5	1
Computer Specialists	0	1	2
Other	1	3	32
Total	290	254	366

Source: INDRHI records

FIGURE 2

CHANGES IN INDRHI PROFESSIONAL STAFF
1983 to 1989

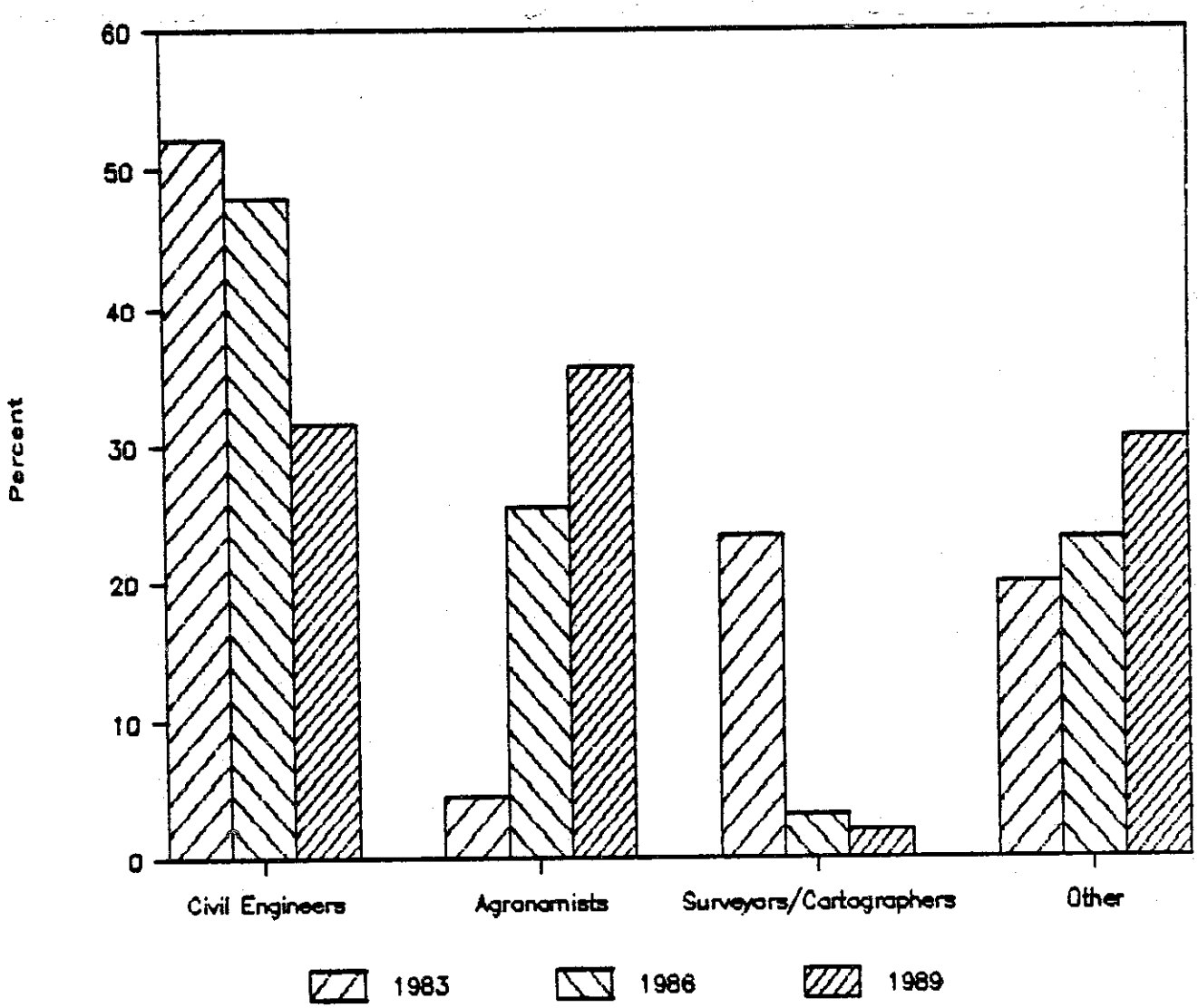


TABLE 11

OFWMP TRAINING FURNISHED THROUGH 1989

Assignment*	Civil	Agron.	Agric.	Socio.	Econo.	Total
	(Number of persons)					
Advanced Degree Program (MS)						
Dept. Districts	0	5	0	0	0	
Other Departments	0	0	0	0	0	
Sub-Total - INDRHI	0	5	0	0	0	
OFWMP	2	13	1	2	2	
						25
Short-term (ex.country)						
Dept. Districts	5	0	0	0	0	
Other Departments	3	16	0	1	0	
Sub-Total - INDRHI	8	16	0	1	0	
OFWMP	4	85	0	2	2	
Junta YSURA	0	2	0	0	0	
Junta PRYN	0	2	0	0	0	
						122
Short-term (in-country)						
Dept. Districts	8	36	0	0	0	
Other Departments	24	8	0	0	2	
Sub-Total - INDRHI	32	44	0	0	2	
OFWMP	4	17	0	2	2	
Junta YSURA	0	4	0	0	0	
Junta PRYN	1	4	0	0	0	
						113

* Most of the staff that were trained were assigned either to OFWMP or to the Irrigation Districts Department.

Source: INDRHI/OFWMP 1990

- In-country short courses were provided for 113 professionals.

OFWMP has successfully trained a cadre of irrigation professionals who can be employed within the country to promote better irrigation management and improved agricultural production from existing irrigation systems. These individuals have training and experience in multidisciplinary approaches to irrigation management. They can be expected to play a future role in irrigation projects concerned with user organization and turnover.

In Santiago, OFWMP has enjoyed close collaboration with the ISA and the Pontifica Universidad Catolica Madre y Maestra. Students in social services have conducted field research in the PRYN Contract I area, which is a designated training center for the university's Department of Social Work. Thus the project has benefitted from access to faculty at both institutions, while students are gaining experience in practical problem solving in the field.

Training activities in the two project areas were directed at extension staff and technicians on one hand and at farmers on the other. In the field, USU appears to have confined its role to training extensionists in irrigation methods, agricultural production methods, and agronomic research design.

Farmer Training

The extension package assembled by OFWMP staff for farmers had two distinct objectives: *capacitación*, or training, and *conscientización*, or consciousness raising.[6] The extension methodology adopted by INDRHI, the Sistema Nacional de Capacitacion de Asociaciones de Regantes (SINACAR), addresses both objectives. The model, which is being used to train water users in Azua and Santiago, is intended for use throughout the country. The SINACAR model includes radio broadcasts presenting information about project, junta, and irrigation district activities. In Azua, socioeconomic staff members broadcast information on YSURA system management and agricultural information interspersed with meringue. An OFWMP-sponsored radio program in Santiago, "El Orientador del Regante," interviewed directors and junta members.

Workshops and short courses in the field, directed at farmer groups and at nucleo and Association representatives, have focused on farmer organization, on-farm water management practices (such as contour furrowing or siphon use), and on the cultivation of irrigated crops. OFWMP has also organized field trips to acquaint farmers with irrigation and water storage facilities.

The evaluators were not able to judge whether OFWMP training activities had made significant changes in the irrigation and agricultural capacities of area farmers. When asked about short courses and field days, farmers were generally positive, but they did not cite specifics of what they had learned that proved valuable later on.

SUMMARY

By the early 1980s, INDRHI recognized the benefits of turning over portions of irrigation systems to users. USAID, with its new emphasis on privatization, linked WUO formation to turnover, providing initial impetus to the transfer process. Thus, the initial success of turnover owes much to the fortuitous convergence of interests on the part of USAID and OFWMP, INDRHI, and farmers in Azua and Santiago, and to the provision of appropriate incentives for INDRHI, the farmers, and junta members to participate in the process.

Working from an already-established institutional policy in support of turn over, OFWMP influenced INDRHI to turn over the distribution systems in the YSURA and PRYN Contract I

areas to WUOs. OFWMP facilitated the subsequent successes of WUOs in these two areas. However, innovations spawned by OFWMP are precarious and not yet fully institutionalized.

The project helped bring about a reorientation within INDRHI from a focus on planning and project construction to one of increased concern for water use. The reorientation is evidenced by changes in INDRHI professional staff, with agronomists now more numerous than civil engineers.

The project has trained over 250 professionals working in the Dominican irrigation sector and also many farmers. Most of the professionals have on-the-job experience in the project. They should be used to facilitate the turnover process in other irrigation systems in the country. USAID may wish to condition future support to INDRHI on establishment of a timetable for turnover of other irrigation systems.

NOTES

1. Creacion y Motivacion de las Asociaciones Regantes, INDRHI, July 1982.

2. "Don Prudencio Regador" and similar pamphlets with localized focus, INDRHI, 1984.

3. Many of these political appointees remain in the two project areas and, even if they no longer control water distribution, they continue to make trouble for the juntas.

4. D. Steen, personal communication to evaluation team, January 1990.

5. We were told that when the OFWMP terminates, INDRHI staff in OFWMP will remain with the agency but be assigned elsewhere.

6. *Capacitación*, generally translated as training, connotes a general enhancement of the farmer's ability to manage his affairs. *Conscientización*, a term made popular by Paulo Freire's classic Pedagogy of the Oppressed, refers to teaching exercises that allow the recipient to come to an accurate understanding of his condition.

8

TECHNICAL ASSISTANCE ISSUES

Technical assistance has been provided to OFWMP through a contract with Utah State University (prime) and Chemonics' International Consulting Division (sub). The level of effort initially contracted was for 302 person-months (PM). This was increased to 430 PM in February 1987 and to 442 PM in March 1989. The TA contract is for $5.31 million dollars or 47 percent of the funds obligated to date. The contract covers staff time and the purchase of minor equipment.

The remaining portion of USAID funding is for administration ($0.32 million); long- and short-term overseas training and local training ($1.51 million); heavy equipment ($0.83 million); vehicles ($0.37 million); construction ($2.8 million); and evaluations ($0.22 million). In January 1990, committed funds were $11.36 million out of a total of $12.0 million budgeted.

THE CONSULTANTS AND THE MISSION

Internal disagreement between USU and Chemonics personnel occurred early in the project. This disagreement was attributed to USU's failure to include Chemonics staff at negotiations and in communication between Chemonics staff and USAID; personal differences leading to back-biting; and to differences in approach, with USU said to emphasize physical works rehabilitation and Chemonics the socioeconomic part of the project.[1] Internal team differences became known to the Mission and to INDRHI. This eroded USAID/INDRHI confidence in the TA team, and contributed to the following outcomes:

- Reduction of long-term expatriate staff assigned to the project. Of eight individuals initially on long-term assignment, only one has been continuously assigned from project inception to the present date. In 1986, the Mission, citing Washington directives, formally asked USU to reduce the TA team to three individuals; and

- De Facto withdrawal of project leadership from USU and vesting of leadership in the Mission. This leadership change dates from May 1987, when the USU Chief-of-Party left the country. He was not replaced.

CONCEPTUAL CHANGE

The TA team began its work in country in March 1985. Shortly thereafter, a new Mission Director arrived. According to the Internal Review Team Report, the Director reviewed the portfolio (1) to reduce public sector subsidies (conditioned by the external debt of the DR) and (2) to examine projects against USAID policy directives to promote private sector involvement. On both accounts, OFWMP was found to need restructuring.

The USAID status report of March 1986 gave the project a "C" rating and recommended that it

shift attention from pilot-area research and engineering innovations to strengthening the role of farmer organizations as a way to achieve better on-farm water management. The change in project focus to system turnover took 18 months to achieve, from late 1985 to early 1987, and culminated in a revised contract dated February 20, 1987. These changes resulted in changes in the types of TA that were appropriate. Credit was eliminated. Production economics, agronomy, and sociology were largely left to INDRHI-OFWMP professional staff. Irrigation district management and drainage became new points for emphasis.

In August 1986, Mission staff met with the INDRHI Director to gain his approval for the change in project focus. One effect was that money earmarked for INDRHI to purchase heavy equipment was eliminated from the budget. USU staff found themselves in the position of having to promote a USAID policy counter to INDRHI interests.[2] This must have worsened relations. Later, in November 1988, funds for equipment were restored, but the equipment was earmarked not for INDRHI but for the juntas. The type of equipment was also changed from tractors and other equipment to be used on demonstration farms to heavy equipment for irrigation and drainage system construction, rehabilitation, and maintenance.

The Mission should be commended for its insistence on a major refocus of the project shortly after its initiation. Results of refocus in favor of turnover are a major accomplishment of the project.

A CHANGE IN FOCUS: FROM RESEARCH TO DEVELOPMENT

As originally conceived, OFWMP had both research and development foci. Soon after arrival of the USU/Chemonics team, the Mission chose to emphasize development and to downplay research. Some may argue that the Mission did not explicitly de-emphasize research. If so, then the de-emphasis was at best inadvertent — a result of the reduction in long-term staff. As early as the summer of 1986, USU recognized the downturn in research and the Bishop Report (1986:24) comments that the project "has almost no research." The university concluded that it should not be engaged in projects like OFWMP that lack the teaching, research, and extension elements consistent with a university's purpose. Even though the number of long-term advisors was reduced, USU could have compensated for this reduction and met project research aims through timely provision of short-term TA.

The refocus from research to implementation had a down side. Given the limited focus of early research efforts on pilot areas and the need for continuing attention to research design and methods, USAID's decision to downplay research meant that the database for measurement of project progress and accomplishments is weak if not altogether absent. The project has not provided an accurate database of preproject conditions to measure project progress and document accomplishments. For example, accurate data do not exist for areas irrigated, the reliability of water delivery to tail-end farmers,[3] and drainage outflows. Data are available for water deliveries to the systems but these data sets begin only in 1988. Moreover, there has been data collection for agricultural production in the PRYN Contract I area, but no analysis of what the data mean.

USU was perceived by the Mission and by INDRHI to be slow to change from data-gathering or research to programs in support of turnover. The evaluation team believes that the USU team was slow to grasp the importance of elevating the turnover objective as the one of primary importance to the Mission. None of the parties, USU, INDRHI, and the Mission, could have envisioned the rapidity with which viable farmer organizations were established via support from the project.

LACK OF USAID AND INDRHI SUPPORT FOR THE TA TEAM

Problems with regard to the lack of USAID and INDRHI support for the TA team and the project were mentioned in writing as early as October 1985 (Chapman 1985). The Bishop Report (1986) does a good job of summarizing the problems and constraints. The fact that the TA was loan-funded created problems. Because of loan funding, INDRHI felt that it was entitled to scrutinize consultants' salaries and have direct control of all expenditures. However, INDRHI was incapable of the efficient management required. Imposition of INDRHI procedures on top of those required by USAID was characterized as a nightmare by one Dominican staff member who has since resigned from the project. For example, no funds were available for conduct of field operations. Vehicles arrived in country only in January 1987, and rental cars used by the TA team while waiting for project vehicles wound up costing more than twice that of the purchase price of the vehicles. Housing and furnishings were not made available to consultants on a timely basis.

Things have improved. However, some problems — equipment acquisition, for example — continue. At least one pickup truck is still in customs as this report is written. Regardless of the reasons the Mission gives for not being able to obtain heavy equipment for the project, and the changes that have occurred, we are now five years into the project and most of the heavy equipment is still not on order. Importantly, the juntas, for which the equipment is destined, may become disillusioned with OFWMP's failure to deliver.[4]

FUTURE ROLE FOR USAID

To solidify the gains made to date by OFWMP, the evaluation team recommends continued action by the USAID Mission in three ways: (1) demonstration of continued interest; (2) monitoring of junta evolution and the turnover process; and (3) short-term technical assistance in selected fields.

Demonstrate Interest

Juntas are new organizations without legal underpinning. They exist in a country where extreme change can occur quickly and for political reasons. In this context, perhaps the most critical assistance which the USAID Mission can give is to demonstrate the continued interest of the U.S. government in junta development and in turnover. By demonstrating interest, the Mission will signal INDRHI and other GODR agencies that the processes started by OFWMP are ones that the U.S. government would like to see continued. USAID's continued interest can be manifest through actions such as future visits to the project areas and to junta offices by USAID officials; Mission sponsorship of visits by outside irrigation experts; and the convening of a workshop or seminar with outside participation to help bring gains made by the project to the attention of others in the international irrigation community. While OFWMP has enjoyed prestige and a high profile within the Dominican Republic, its gains are not widely known outside the country.

Monitor Change

Because the project has made gains of interest to the international community, and ones which are consistent with A.I.D. directions in privatization, the Mission should arrange to monitor and document project-derived institutional change over the next five years. The key items to monitor are the development of the two juntas, the degree to which the turnover model is exported to other irrigation systems in the country, and the impact of turnover upon INDRHI. One way to contract to monitor change is for the Mission to buy-in to the upcoming Agricultural Water Management

Project that is tri-sponsored by the Latin American and African Bureaus and by S&T Agriculture. Alternatively, the Mission could earmark the funds for periodic monitoring by a private group with knowledge of irrigation and with abilities in monitoring and evaluation.

Provide Short-Term Technical Assistance

The USAID presence will be strengthened, as will the juntas, through periodic short-term TA in these areas:

- Irrigation district (system) management (for juntas);
- Governance of irrigation organizations;
- Budgetary needs for system and equipment maintenance;
- Drainage system planning and construction;
- Analysis of agricultural production data; and
- Monitoring of junta development and the turnover process.

In all instances, the Mission should consult with junta management to determine their needs before arranging for TA.

Assistance to juntas in district management, including financial and business management, is especially critical if these organizations are to flourish. Training would be for junta directors and junta staff in sound business practices and proper O&M of irrigation facilities and equipment. The Mission should make funds available for short-term TA to the juntas to enable them to estimate maintenance needs and to raise the level of awareness within the management and the juntas that such needs must be met if good water delivery service is to be continued.

The structure of irrigation organization in Azua and Santiago is new and experimental. It will need fine-tuning in the next few years if it is to effectively represent the interests of all water users. Therefore the team recommends technical assistance in governance to help the juntas:

- Complete nucleo formation in the lower reaches of the Azua system;
- Redistrict or reformulate nucleos and Associations to improve irrigator representation;
- Revise electoral process to ensure better continuity within the Junta Directiva by staggering terms of office; and
- Carry out activities designed to intensify farmer commitment to and participation in local water management.[5]

While the juntas are likely to be able to continue in the absence of any one of these measures, they will not be as strong as they should be.

There are at least three ways to obtain short-term TA:

- Short-term TA furnished by the project;
- Access to Executive Corps staff, a State Department-supported program to access retired business men and women; and
- Arrangements with ISA-CADER, supported by the Mission's University Agribusiness Partnership Project (517-0243), which will be implemented in part by the MUCIA consortium.[6]

If the Mission decides to extend the project, or to design a new project in support of the Dominican irrigation sector, the evaluation team recommends that such support (and its operational design) be contingent on the enactment of legislation giving legal status to juntas and on the institutionalization of the turnover model.

SUMMARY

The TA team provided services which allowed for accomplishment of significant institutional change, formation of WUOs, and turnover of portions of irrigation systems from INDRHI to juntas. This was done in spite of inadequate initial support from USAID and INDRHI that affected morale and impeded early progress. Use of loan funding to finance TA was one cause of the problem. The use of loan rather than grant funding to support TA should be discouraged.

The TA team should be commended for responding flexibly, if not with great speed, to the Mission-initiated change in project concept. The reduction in long-term advisory staff had a negative impact upon the project's ability to conduct applied research and to analyze and document results obtained.

The Mission should (1) actively maintain interest in junta development through visits, and through sponsorship of workshops and publications; (2) arrange to monitor junta progress and the turnover process for several years; and (3) provide TA support in suggested areas.

Future USAID support to the Dominican irrigation sector should be contingent upon passage of legislation giving legal status to the juntas. USAID should make turnover the center of any future assistance to the Dominican irrigation sector.

NOTES

1. These differences were communicated to the evaluation team. They are also referenced in Bishop, et al., 1986.

2. B. Anderson, personal communication to J. Wolf, January 9, 1990.

3. This need is mentioned in the OFWMP Staff report, 1986.

4. The Mission's current thinking is to give juntas certain of the heavy equipment items originally given to INDRHI. The Mission has reached agreement with INDRHI whereby USAID would compensate INDRHI for the equipment and then recondition it prior to delivery to the juntas.

5. Though most of this assistance can come from Dominican institutions, an outsider's perspective may be useful in revising organizational structures and electoral processes.

6. A similar suggestion was made by D. Maxwell in a memo to H. Bassford dated November 25, 1985.

9

THE PROJECT'S IMPACT UPON THE RESOURCE ENVIRONMENT

DRAINAGE AND SALINITY

The salinity problems in YSURA and PRYN Contract I are found only in association with high water tables. Waters in YSURA are hard (dominance of calcium over sodium) and there is no evidence of soil sodicity. Salinity problems are geologic, or soils, in origin and, very near to the coast, are from salt water intrusion — not from importation of surface waters, which are of good quality. With a lowering of the water table and consequent leaching, the salinity problem will likely mitigate. Therefore, we may describe drainage and salinity as a single, related problem.

Data are not precise for characterizing the extent of the problem. However, we have summarized various sources in Table 12.

OFWMP staff informed the evaluation team that the project has reclaimed somewhere between 250 and 500 hectares in YSURA. Through opening drainage outlets and by constructing new drainage works, the project has reduced drainage and salinity problems in perhaps 10-15 percent of the affected area. Because of the irrigation flow reductions described in Chapter Four, we may expect a further lessening of the problems with time. In PRYN Contract I, approximately 400 hectares have been improved, or an estimated 20 percent of the problem zone. Although the project has reduced drainage and salinity pro-blems, it has not yet done enough to improve the drainage problems that still affect a significant portion of tail-end farmers, particularly in YSURA.

TABLE 12

DRAINAGE AND SALINITY
PROBLEMS IN THE OFWMP AREAS

Location and Problem	Area (ha)	Year	Source
Water Table less than 0.5m	1500	1982	Kussow
Water Table 0.5m to 1.5 m	3200	1982	Kussow
Affected by drainage problems	3000	1990	F. Gonzales
Affected by salinity problems	2000	1990	F. Gonzales
PRYN Contract I Affected by drainage problems	2000	1986	L.Hernandez

WATER QUALITY

Table 13 gives data on water quality for the YSURA area.

Electrical conductivity (EC) data indicate that influent water quality is very good and that collector drain and well waters can be used with adequate drainage for the types of relatively salt-tolerant crops (tomatoes, sorghum, and melons) that are most common in the valley. Effluent from tile drains can be reused for agricultural purposes if mixed with supplies from other sources.

TABLE 13

WATER QUALITY – YSURA

Water Source	EC (mmhos/cm)	Source
Irrigation Supply	0.3	Yap
Collector Drains	0.6 - 0.9	Yap
Tile Drains	1.0 - 2.5	Yap
Wells	0.6 - 1.5	Yap, Kussow

The team was told that there have been no analyses of boron, or selenium, or of pesticides in the drains. However, we were informed by two farmers that pesticide poisonings have occurred. One farmer had been to the hospital for detoxification. This problem may be related to the mixing and application methods used by individual farmers and agribusinesses, to a lack of awareness of the importance of caution in pesticide use, or to a lack of training in pesticide use.

This is certainly a concern since drainage water frequently reenters the irrigation system and downstream farmers may use the water for drinking, washing, and bathing. Pesticide contamination in people, animals, waters, and soils is always negative, and such contamination could potentially be a negative consequence of project efforts to increase agricultural productivity.

Near Villa Gonzales, the irrigation canal is also used by several Santiago factories for the discharge of untreated effluent. When flows are low, this water damages some crops, according to the farmers who were interviewed there.

Water quality measurements, particularly for pesticides, should be taken by INDRHI on a regular basis and, if detectable concentrations of pesticides are found, abatement measures should be applied. In future assistance to irrigated agriculture, USAID/DR should initiate user education programs designed to encourage the safe use of pesticides, and the use of integrated pest management technologies.

The evaluation team spoke with an aquaculture professional who has a commercial shrimp operation in the Azua area. He said that the crab population, one which is very sensitive to pesticides, did not appear to be affected in the drains flowing out from YSURA. He also said that the reported decline in coastal fishing in the Azua area is likely due to causes such as water turbidity that are unrelated to pesticide use in YSURA.

EROSION AND WATER USE CONCERNS

Runoff and sediment load data are not available for either PRYN Contract I or YSURA. Visual examination of runoff from irrigated fields and pilot area drains showed highly turbid water. It is possible that present water application methods may be contributing to accelerated soil erosion. Data allowing conclusions on this point are not available.

ROLE OF INDRHI

INDRHI is the GODR institution charged with regulation of surface and groundwaters. Particularly as construction of major water projects slows and as O&M for irrigation systems is turned over to local organizations, INDRHI can be expected to play a larger role in stewardship of natural resources. We have observed similar changes by water agencies similar to INDRHI in other countries. In light of Sections 118 and 119 of the Foreign Assistance Act, USAID may wish to consider support to INDRHI to assist that organization in taking the steps necessary to fulfill this role.

SUMMARY

OFWMP has had a positive impact upon the resource environment by reducing the extent of

drainage and salinity problems in YSURA and PRYN Contract I. At the same time, the evaluators find cause for concern as to possible negative impact upon water quality and human resources caused by pesticide use in the project areas. It is A.I.D. policy that natural resources be used sustainably in rural development. In future assistance to the Dominican agricultural sector, USAID should take a stronger proactive stance concerning the sustainable use of natural resources. The evaluators recommend that USAID allocate funds for the study of these effects and use the results of these studies and other accumulated knowledge to program requisite abatement technologies into future assistance to the Dominican agricultural sector.

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SUMMARY OF RECOMMENDATIONS

Divide Responsibilities Among Institutions

GODR, INDRHI, and the Juntas de Regantes must formally agree on their respective duties and responsibilities in system management and operation (Chapter Seven). The evaluators support the current ad hoc arrangement, where INDRHI retains responsibility for the main system — management of the main canals, principal diversion works, dams, and reservoirs. INDRHI would also continue its role in water resource development and act as a regulatory agency for water use. And INDRHI would continue to have responsibility for the operation of natural water channels, rivers, arroyos, and other features necessary for flood protection.

The juntas would continue to manage the irrigation delivery system commencing at the lateral turnouts. Responsibility for the drainage system is not now assigned to either INDRHI or the juntas. Unless it becomes part of junta responsibilities, it is likely to continue to be ignored. Once new construction and rehabilitation have been completed, drainage system maintenance should become a junta responsibility. However, distinction must be made between drainage and flood control. Responsibility for the latter must be INDRHI's (Chapter Three).

Set Core Junta Functions

The evaluators recommend that, in their initial years of operation, the Juntas Directivas concentrate their human and financial resources on a core set of functions (Chapter Five):

- Irrigation system operation, commencing at the lateral gate, to include allocation and distribution of water to all users;
- Irrigation and drainage system maintenance;
- Business management, including budgeting; the collection of revenues (water fees); the control and programming of expenditures; and the keeping of records necessary for business management; and
- Provision of an organizational framework for system operations, rule enforcement, conflict resolution, and problem solving.

These functions should be defined and carried out with the full, democratic participation of farmers.

The Juntas Directivas have shown interest in activities beyond core functions. Examples include marketing, credit, and agricultural extension. These activities are compelling and reflect legitimate and urgent farmer concerns. However, at least in the early and financially uncertain years, the evaluators recommend that the juntas generally restrict such activities because it will spread too thinly the limited financial resources and managerial capacity of the juntas (Chapter Five).

Legally Empower the Juntas

GODR must legally empower the Juntas de Regantes to perform their core functions, impose sanctions, and enforce their mandate. Dominican water law gives INDRHI the power to distribute and allocate water at farm level, and to set and collect water charges. These are among the proper core functions of the juntas, and must be formally and legally transferred to them. USAID should condition future assistance to the Dominican irrigation sector on GODR passage of legislation which empowers the juntas (Chapter Five).

Raise the Level of Collections

The budget prepared by the YSURA junta for 1989/90 indicates a gap between revenues and projected expenditures of RD$ 180,000. This shortfall will be made up by deferring expenditures for repairs and maintenance. This is precisely the policy followed by INDRHI which led to gross deterioration of the irrigation and drainage facilities. Further, the evaluation team believes that amounts budgeted by both of the juntas are insufficient to support normal and regularly scheduled preventive maintenance of facilities and equipment (Chapter Six). During 1990, the juntas, with USAID-supported assistance, should estimate the full costs of operating and maintaining the irrigation and drainage systems, and plan to gradually increase their water charges and fee recovery to cover necessary maintenance expenditures and to permit an accumulation of cash reserves (Chapters Six and Eight).

Program the Spending of Remaining OFWMP Funds

Concerning the expenditure of remaining OFWMP funds, the evaluators recommend three priorities:

- Completion of the rehabilitation of the two irrigation systems, especially the drainage networks for Lateral 6 and the lower parts of Lateral 1 (Chapters Three and Five);

- Provision of short-term technical assistance related to junta business and financial management. This should include studies of adequate levels for O&M expenditures, governance assistance, and management training (Chapter Eight); and

- Delivery of a reduced list of selected heavy equipment to juntas that was budgeted under OFWMP (Chapter Eight).

The evaluators recommend that all remaining OFWMP funds destined for the project areas and the juntas be programmed and expended in consultation with the two juntas (Chapters Five, Six, and Eight).

Monitor the Equity of Water Distribution

Perhaps the greatest accomplishment of the project has been to deliver water reliably to a large number of tail-end farmers in the two systems. But the project has not established ways to monitor actual water flows to the various parts of the systems and to compare these with allocated amounts. The project should obtain measurements of water delivery equity (Chapter Four).

Suspend Work on Pilot Area Development

The expenditure of remaining OFWMP funds for pilot area development would be detrimental to organizational efforts and should be a low-priority item. Money spent in pilot areas could be used to rehabilitate portions of the systems that are in disrepair or not completed. This could attract additional farmers into joining the juntas and paying fees (Chapter Six). Further work on construction in pilot areas should be halted (Chapter Three). Decisions regarding future construction work in pilot and other areas should be made with participation of the juntas.

Continue Financial Assistance to the YSURA and PRYN Contract I Juntas

The evaluators recommend that USAID continue assistance to the two juntas beyond the end of the OFWMP by programming fixed amounts of local currency (RD$) for a limited period not to exceed three years. Support should be provided under a matching funds arrangement with money set aside by the juntas to be matched by USAID. Use of funds would be restricted to irrigation and drainage facilities repair and maintenance, and to equipment repair, replacement, or rental (Chapter Six).

Pursue Turnover and User Control

Building upon the human, managerial, and organizational achievements of OFWMP, INDRHI is considering turnover of other systems to organized water users. USAID should work with INDRHI and the existing juntas to support turnover in other irrigation systems in the country (Chapter Eight). The Mission should condition future support to INDRHI on establishment of a timetable for turnover of other irrigation systems (Chapter Seven). INDRHI staff trained by the project are a resource that should be used to facilitate the turnover process (Chapter Seven).

Monitor Progress on Turnover and User Control

Turnover innovations, pioneered by OFWMP in the Dominican Republic, are consistent with similar efforts in Asia and elsewhere in Latin America. The project's achievements in privatization, local empowerment, the advancement of grassroots democracy, and the generation of income among the rural poor can form a basis for development assistance to irrigation. The Mission must maintain an active interest in junta development through periodic visits, and through sponsorship of workshops and publications dealing with the project (Chapter Eight).

Before the end of the project, the evaluators urge USAID, in collaboration with OFWMP and the juntas, to draw up a list of technical, social, and institutional indicators of project impact and make arrangements to measure these indicators beyond the end of the project to monitor the sustainability of project innovations. Because of the great promise of the junta model and of the turnover process, USAID should commit resources to the periodic monitoring of these indicators (Chapter Eight).

The upcoming Agricultural Water Management Project (AGWARM), to be centrally funded by the S&T, Latin America, and Africa Bureaus, will provide modest funding for irrigation research. USAID may wish to participate in AGWARM, or have that project monitor the OFWMP experience. Alternatively, the Mission might contract with a U.S.-based monitoring and evaluation group to evaluate accomplishments. The accomplishments of this project, and the positive roles played by the Mission, INDRHI, and the consultants, should be documented and disseminated (Chapter Eight).

Monitor Environmental Impacts

In future assistance to the Dominican irrigation sector, USAID should take a proactive stance concerning the sustainable use of natural resources. The evaluators recommend that USAID allocate funds for the study of project side-effects, such as increased pesticide use, and use the results of these studies and other accumulated knowledge to program requisite abatement technologies into future assistance to the Dominican irrigation sector. Sustainable environmental and natural resource management is not contradictory to the goal of rural income generation or to resource use. Sustainable, resource-conserving, and income-enhancing technologies for soil and water use exist and, under Agency policy, should be used (Chapter Nine).

APPENDIX I

SCOPE OF WORK

SCHEDULE

Article I - Background

A. Project Purpose and Funding

The project will strengthen the capability of the Government of the Dominican Republic (GODR) to: (a) plan effectively the development of its water resources for irrigation; (b) plan the operation and maintenance of irrigation systems efficiently and effectively; (c) support increased agricultural productivity under irrigation; and (d) prevent and/or correct the deterioration of land resources presently under irrigation. The National Institute for Hydraulic Resources (INDRHI) is implementing the project. The project was approved on June 30, 1983 and will terminate on September 30, 1990.

The project is being financed by twelve million dollars ($12,000,000) of loan funds from AID, and the equivalent of seven million sixty three thousand dollars ($7,063,000) in dominican peso counterpart.

B. Project Activities

The project is being implemented in two phases. The first phase (completed by October, 1986) focused on gathering information on irrigation operation and maintenance, organizational modes and production practices of the two targeted irrigation districts (one in the south, with 7,000 hectares and another in the north, with 5,200 hectares). Activities being carried out in the second phase focus on rehabilitating the irrigation and drainage systems, transfering operation and maintenance of these systems to water users' associations, increasing productivity by improving on-farm water management practices, reclaiming and draining soils which have water logging and/or salinity problems, and strengthening INDRHI's capability to plan for and monitor water and land resources in the targeted irrigation districts. To plan and effectively carry out these activities, the project is utilizing a resident technical assistance team that provides advice on district management, water users' association development, drainage, on-farm water management, and on-farm demonstration and training. Utah State University is the contractor and Chemonics International is the sub-contractor.

Article II - Title

Mid Term Evaluation of the On-Farm Water Management Project in the Dominican Republic.

Article III - Objectives

This evaluation will: (1) determine the validity of project objectives, and appropriateness of the basic documents (Project Paper, Loan Agreement and its Annex I Revision) and implementation plans; (2) determine the degree of success with which project outputs are being achieved and plans are being implemented; (3) identify constraints that may be impeding project implementation and recommend strategies to overcome these constraints and increase effectiveness of project implementation; (4) based on the degree of success and the importance of the project achievements, prepare detailed recommendations to USAID regarding future actions that should be taken by the Mission to continue supporting this type of project in other irrigation districts; and (5) recommendations regarding future assistance to the current project and specifically to the water users' associations in Santiago and Azua.

Article IV - Tasks

The team will use a participatory methodology for obtaining the documentation and information necessary for the evaluation. This methodology implies the involvement of farmers of the pilot and irrigation district areas, and the INDRHI technicians in charge of project implementation.

As a minimium, the evaluation report will address the following items:

1. Institutional project issues: a) Relationship between the project outputs and project purpose; b) institutional strengthening and orientation of roles and responsibilities, focusing specifically on INDRHI, the water users' associations and the boards of directors created by the project; and c) internal organization of INDRHI for the implementation of the project, including the creation of the central and field implementing offices and the creation of a drainage unit in the agency with the responsibility for reclamation and/or prevention of deterioration of agricultural soils.

2. Irrigation system rehabilitation issues: a) planned vs. current project outputs; b) review of existing infrastructure inventory and actual physical conditions; c) level of rehabilitation in both the irrigation and drainage systems (main, lateral, tertiary, etc.); d) assessment of the following rehabilitation activities: sediment removal, weed control, lining repair, canal berm repair, repair and installation of gates, turnouts, control structures, drops and energy dissipators, desilting works, drainage inlets and outlets, culverts and underpasses. A comparison will be made of the number and condition of infrastructures at the beginning of the project and at current levels.

3. Water users' associations issues: a) planned vs. actual number of water users' associations created; b) number of farmers actually represented by the associations; c) area of cropped land covered; d) general description of the associations: how they are organized, their functions and goals, etc.; e) description of the water users' associations' board of directors, and the technical/administrative offices in Azua and Santiago; f) the effect of training on the boards and the executive offices; g) comparison of the current water delivery efficiency and at the beginning of the project: amount of water delivered, delivery efficiency, timely delivery, delivery schedule, number of hectares irrigated, number of persons envolved directly and indirectly, monitoring water delivery, water users' delinquency, crop water requirement as a basis for water delivery; h) managerial aspects: water users' associations' budgeting, planning, cropping pattern, financial control, organization, fee collection and contract administration; i) comparison between goverment and water users' association administration: cost effective operation and maintenance of the system.; and j) an in-depth study of the associations, the boards of directors and the executive offices. The study will focus on the associations' rate of progress toward attaining financial self-sufficiency and improved managerial capability, and will identify the associations' most important weaknesses and needs. Based on the contractor's findings, the study will analyze the current associations' institutional status, and will recommend appropriate actions for future strengthening, considering a long term frame and the objectives of the associations. Specifically, the contractors will address the following issues: the future of the water users' associations following project termination, the possibility and strategies for sustainable growth, and the future role of INDRHI, the USAID and other institutions in the developement of the associations.

4. On-farm water management issues: a) effect of project demonstration and training activities on the increase of crop productivities for at least 560 farmers, covering at least 1,150 hectares; b) effect of land leveling on crop productivity, irrigation efficiency and irrigation cost as part of the total production cost; c) effect of drainage construction on reclamation of water logged and saline soils and on soil productivity; d) inventory assessment of the tertiary irrigation canals newly constructed or reconstructed, and their effect on the improvement of water delivery at farm level, and land productivity; e) inventory assessment of the land leveled and drained, and the drainage ditches constructed.

5. Training/project personnel issues: a) rate of migration of project personnel; b) level of training (on the job, in-country, and academic and short term off shore) of the personnel and the effect of training on the efficiency and effectiviness to manage the project, carry out activities and achieve goals; c) Project's capability and commitment to initiate similar project activities in different irrigation districts; d) review of farmer training activities and an assessment of the effect of training on: the improvement of the irrigation district management, the increase of irrigation efficiency and crop productivity; e) generation and dissemination of project information, classification (i.e., for farmer/technician training, reports, publications, etc.) quality and availability to farmers, technicians and other agencies.

6. Technical assistance issues: a) assess the level of effort of Utah State University since project initiation and their implementation methodology; the analysis will reflect the relationship among the project purpose, the project activities, AID's view of the project and its activities and USU's viewpoint.

7. Overall project strategy and methodology: a) a general assessment of the overall project strategy and methodology to define and achieve outputs, and to plan and carry out activities.

8. Recommendations to the Mission and to INDRHI: a) based on project achievements, findings and importance to the developement of irrigated agriculture in the Dominican Republic, and based on the experience gained by USAID and INDRHI in the implementation of the project, define future appropriate actions to be taken by AID regarding the implementation of this type of project in different irrigation districts and the strengthening of current water users' associations in Santiago and Azua; b) the team will include a general strategy to be implemented by the Mission which will cover the recommendations for future actions.

To achieve the tasks described above, the evaluation team will:

a) Review the basic project documents such as : project paper, loan agreement and its revision to Annex I, implementation letters, PIO's, procurement letters, technical assistance contracts and reports, workplans, procurement plans and actions, training plans and implementation, redesign/concept papers, AID semester reports and reviews, technical assistance reports, INDRHI and water users' association reports, local or US university publications and other documents.

b) Work directly with: (1) the INDRHI implementing offices in Santo Domingo, Santiago (two and a half hours north of Santo Domingo) and Azua (two hours west of Santo Domingo), to interview INDRHI past and current Executive Directors and project staff and obtain pertinent documentation; (2) the water users' associations' board of directors' offices in Santiago and Azua to obtain information and documentation from the board members and the technical/administrative staff; (3) USAID to obtain information and documentation from Mission Director, the Agriculture and Rural Development Division Chief, the project manager and other ARD staff; (4) other private and/or public agencies or individuals directly or undirectly related to the project; and (5) Utah State University technical assistance members in the country and at Logan, Utah (travel to Utah is not contemplated; the evaluation team may communicate with Logan by phone, fax, cable or letter.)

Article V - Reports

The contractor will submit to the ARD Division Chief five copies of a draft report in English, which will include: a) an executive summary which will include comments on impacts and lessons learned; b) all the information outlined in the Statement of Work, including the objectives of the evaluation, tasks and assessments, a description of the assessment methodology, a list of the persons and institutions contacted, a paginated table of contents, graphs and tables, and a clear presentation of the evaluation findings, analyses and recommendations; and b) a work plan to be prepared and submitted to ARD within the first 3 days after arriving to post, which will provide a schedule of activities for the entire evaluation process.

Ten copies of the final report in both English and Spanish will be submitted by the contractor to the Chief USAID/ARD Division or his designate, prior to completion of this service.

Article VI - Relationships and Responsibilities

The team will work under the technical direction of the Chief of the Agricultural and Rural Development Division at USAID/Santo Domingo, or his designate. All contact with the Government of the Dominican Republic, or representatives of the Dominican private sector will be coordinated through the USAID/ARD Division.

Article VII - Performance Period

The estimated period of performance is January 5 through March 31, 1990.

Article VIII - Team Composition and Qualification

All personnel working on the evaluation in the Dominican Republic must have at least a FS1 S3/R3 Spanish capability in order to conduct interviews at institutional and farm level, and to review the information available (which will be found in both English and Spanish languages.)

A team leader will be designated by the contractor among the specialists conducting the evaluation. The team leader will be the specialist considered by the contractor to have the most appropriate experience to conduct the evaluation. The type of experience to be considered, in addition to the experience discused below, will include evaluation of similar USAID projects, evaluation of service institutions in the private and public sectors, experience in the preparation of USAID Project Identification Documents and/or Project Papers and/or Concept Papers. The contractor will submit to USAID/DR a justification, based on the specialist' qualifications, for the nomination of the proposed team leader. Concurrence by USAID/DR is required for all team members, including the team leader, prior to initiation of the evaluation.

The following disciplines, qualifications and level of experience are considered necessary to complete the evaluation:

1) Irrigation District Management Specialist.

The irrigation district management specialist will evaluate the issues related to the water users' associations (Article III, Section 3), the boards of directors and the associations' technical/administrative offices for Santiago and Azua, institutional building (Art. III, Section 1), technical assistance (III-6), and overall project strategy and methodology (III-7).

Minimum qualifications and experience: Master's degree or equivalent in irrigation or agricultural engineering or a related agricultural field. Five years of experience related to the management of irrigation districts. Extensive knowledge of irrigation district organization, operation and maintenance of irrigation and drainage canals and heavy machinery, personnel and administrative procedures and policies, financial controls, and water use fees and collection systems.

2) Rural Sociologist.

The sociologist will address the organization and development of the water users' associations and will focus on the strategies followed by the project technicians for the creation of the associations, the socio-cultural, institutional, economic and managerial aspects related to the creation and the performance of the associations, the board of directors and their technical/administrative offices for Santiago and Azua. The specialist will evaluate the project/INDRHI professional capability to organize and train water users' associations. The sociologist will also address the following issues: institution building (III-1), water users' association (III-3), project personnel development and training (III-5), assessment of technical assistance (III-6), and overall project strategy and methodology (III-7).

Minimum qualification and experience: Master's degree in rural sociology or equivalent. Experience in the area of organization and training of water users' associations in the United States or Latin-american countries. Experience in the conduction of institutional analysis of private and public agencies responsible for the supply of primary services to farmers such as technology transfer and provision of irrigation water, in the agricultural sector, specifically in irrigated agriculture.

3) Agricultural Economist

The agricultural economist will work directly with the project technicians to evaluate the efficiency of investment of the project activities, such as: creation/strengthening of water users associations, drainage, land leveling and farm improvement, training to farmers and project technicians in improved irrigation practices. The economist will examine and evaluate changes in cropping patterns, land productivity, effectiveness of land use, and the economic impact of the project on the two irrigation district areas, at the farm and regional level.

The economist will also analyze the economic impact of the transfer of operation and maintenance of the two irrigation districts from INDRHI to the water users' associations: efficiency of the irrigation system operation, including water supply reliability and its effects on the yearly cropping rate, farmers' attitudes and income, and the overall water delivery and application efficiencies. The economist will address the operation of the water users' associations' boards of directors and the administrative office, including an assessment of the water fee for Santiago and Azua. Also, the economist will address the following issues: institutional building, (III-1),

water users' associations (III-3), on-farm water management (III-4), assessment of technical assistance (III-6), and overall project strategy and methodology (III-7).

Minimum qualification and experience: Master's degree in Agricultural Economics. Five years of experience in economic analysis of projects, public or private agricultural service agencies such as water users' associations.

4) Irrigation/Drainage Specialist

The irrigation and drainage specialist will evaluate the impact of the following project activities: the rehabilitation of the irrigation system, improved on-farm water management practices, drainage, and the improvement of farm infrastructures, such as land leveling and farm irrigation and drainage canal construction. The specialist will evaluate the effects of these activities on the efficiency of water distribution and on-farm application, increase of cropped area, increase of crop production at district level, and increase of land productivity for Azua and Santiago. The specialist will also address the following issuess: institutional building (III-1), irrigation and drainage structure rehabilitation (III-2), on-farm water management (III-4), assessment of technical assisstance (III-6), and overall project strategy (III-7).

Minimum qualification and experience: Master's degree in Irrigation and Drainage or Agricultural Engineering. Five years of experience in different aspects of efficient water use on several crops with emphasis in surface irrigation, and drainage of irrigated agricultural land.

Article IX - Level of Effort

The estimated level of effort totals 126 person-days (30 person-days for each specialist and 6 extra person-days for the team leader.) A six day work week is authorized for the contractor.

Article X - Special Provisions

A. Duty Post: The contrator will carry out services in the Dominican Republic, more specifically in Santo Domingo, Azua (two hours west of Santo Domingo) and Santiago (two and a half hours northwest of Santo Domingo.) The contractor will arrange all travel to and within these areas.

APPENDIX II

LIST OF PERSONS AND INSTITUTIONS CONTACTED

Persons Interviewed and their Affiliation
On-Farm Water Management Project Evaluation

Adame, Fernando, Ditch Tender, Toma 10, Lateral I, and four Irrigators of that toma, YSURA.
Agromonte, Jose, Agronomist, SEA, Azua.
Anderson, Bruce, Former COP, USU, OFWMP.
Beltréz, Carlos, Socio-Economic unit, OFWMP-YSURA.
Beltréz, Tomás, Ex-oficio member of the Junta (Prologación), YSURA.
Beltréz, Nicolás, President, Lateral 5; and Secretary, Junta de Regants, Azua.
Bonilla, Junior, Junta Technician, Sector Bombeo, PRYN.
Cabrera, Alejandrina, Asistente Social en Desarrollo Rural, OFWMP-PRYN.
Castillo, Andres, Operations Manager, DOMEX, Azua.
Cruz, Cesar, ARD, USAID, Santo Domingo.
Cruz, Romulo, Junta Advisor, PRYN-Contrato I, Sector Villa Gonzalez, Toma G3-2, PRYN.
D'Oleo, José, Chief of Drainage, OFWMP-YSURA.
Dario de Leon, Jorge, Second Vocal, Junta de Regantes, Presidente, Sector Santiago, PRYN.
de la Rosa, Edilio, Director of Operations, OFWMP y Junta, PRYN.
De Pena, Pedro, Chief of Model School, Villa Gonzales, PRYN-Contract I
Diaz, Cristino V. Asesor and former Vice President, Junta de Regantes, PRYN.
Diaz, Carlos, Director, OFWMP-YSURA, INDRHI.
Ditch Tender, Toma #36, Lateral 6; nine farmers from that toma, YSURA.
Ditch Tender, Toma #1, Lateral 5, YSURA.
Duran, Maria "Chicha," Farmer, Toma3-2, Sector Ponton, PRYN.
Echavarria, Santiago, General Manager, DOMEX, Azua.
Farmer, Asociación La Esperanza, Lateral 2, YSURA.
Farmers, Proyecto Finca Banegas, Finca Navarette, PRYN.
Farmers, Toma 17, Lateral 5, YSURA: 3 of them, damaged by the construction of showcase drains.
Farmers, Toma 8, Lateral I, YSURA.
Farmers, about 10 of them, from Tomas N4 y N5, Navarrete and Tomas G3-2 and G5-1, Villa Gonzalez, Sector Navarrete, PRYN.
Felipe, Nicolas "Negro", Farmer, Toma BI-10, Sector Bombeo, PRYN.
Fernandez, Andres, Manager, Junta de Regantes, PRYN.
Figeredo, Agapito, Técnico, Lateral 5, YSURA.
Gabon, Leonardo, Ditch Tender, Toma #8, Lateral 2 YSURA.
Gardella, David, ARD, USAID, Santo Domingo.
Gonzales G., Fernando, Advisor, OFWMP, YSURA.
Gonzalez, Ramon "Mamo", Farmer, Toma 19, Lateral 5, YSURA.
Hernandez, Luis, Director, OFWMP-PRYN INDRHI.
Hernandez, Santos, Chief of operations section, YSURA Irrigation District, INDRHI; Encargado de Operaciones OFWMP.
Lopez, Francisco, Tecnico, Sector Navarrete, PRYN.
Lucía, José, Ditch Tender, Toma #7, Lateral 2 YSURA.
Luciano, Juan, Farmer, Toma N1-1, Sector Navarrete, PRYN.
Marte, Domingo, Farmer, laterai 6, YSURA.
Martin, Santiago, Farmer, Toma N1-5, Sector Navarrete, PRYN.
Martinez, Evangelista, First Vocal, Junta de Regantes, PRYN.
Martinez, Rafael, Sub-Director OFWMP, INDRHI, YSURA and Encargado, Production and Farm Management.
Matos, Aris, Encargado de Riego, OFWMP-PRYN, INDRHI.

Medina, Pablo, Rehabilitation Section, OFWMP, YSURA.
Mejía, Dionisio, Socio-Economic Section, OFWMP YSURA.
Medina, Ramón, Lateral president, and member, Junta de Regantes, YSURA.
Mejia, Francisco, Farmer and Secretario del Sector Ponton, Toma P1-4, Ponton, PRYN.
Menalla, Juan, President, Sector Bombeo, PRYN.
Mendes, Victor, Técnico, Lateral 6, YSURA.
Mendez, Nelson, Tecnico, Lateral IB, YSURA.
Mendez, Bidal "Cacarín", Ditch Tender, Puerta 4, Sub-lateral 11, Lateral 2, YSURA.
Minaya, Juan, Vice President, Junta de Regantes, PRYN, Sector Bombeo.
Montaño, Narciso, President, Lateral 3; and Treasurer, Junta de Regantes, YSURA.
Mora, Francisco, Secretary, Lateral 6, Junta treasurer, YSURA.
Morel, Julio, Agronomist, SEA, Azua.
Nova, Pedro, Farmer and honorary Ditch Tender, Finca #3, Lateral 6; seven irrigators from that finca, YSURA.
Nova, José, President, Lateral 6, and member of the Junta de Operaciones, Junta de Regantes, YSURA.
Ortiz, Ignacio, Farmer, Lateral 6, YSURA.
Parra, Fernando ("Cuca"), Farmer, Sub-Lateral 2, Canal 11, YSURA.
Pejero, Miguel, Farmer, Toma N1-4, Sector Navarrete, PRYN.
Pena, Angel, President, Sector Ponton, PRYN.
Peña, Angel Danilo, Secretary, Junta de Regantes, PRYN, Sector Pontón.
Peralta, Javier, Tecnico, Sector Ponton, PRYN.
Perez, Juan, Ditch Tender, Toma G5-1, Sector Villa Gonzalez, PRYN.
Perez, Hugo Miguel, Representante, Toma BI-18 y BI-19, Sector Bombeo, PRYN.
Perez, Tirso, President, Lateral 2; and 2nd Vocal Junta de Regantes, YSURA.
Perez, Francisco, Technician, Junta de Regantes, Sector Navarette, PRYN.
Perez Cuevas, Angela Maria, Assistant Director, Control de Proyectos, INDRHI.
Pimentel, Giovanni, Technician, Junta de Regantes, Sector Villa Gonzalez, PRYN.
Ramirez, Rafael, Tecnico, Lateral IA, YSURA.
Ramirez, Agapito, Ditch Tender, Toma 17, Lateral 5, YSURA.
Ramirez, Bienvenido, Farmer, Finca #4, Lateral 6,YSURA.
Ramirez, Jose, Farmer, Tomas 14 and 16, Lateral I, YSURA.
Raynolds, Laura, Rural Sociologist, Cornell University. Research on contract farming in Azua, Yaque del Norte.
Reynoso, Antonio "Mocano", Ditch Tender, Tomas 19 and 21, Lateral 5, YSURA.
Reynoso, Gilberto, OFWMP Director, INDRHI, Santo Domingo.
Rivas, Alvin, Director of Operations, INDRHI, PRYN Contract I.
Robert, Carlota, Chief, Office of International Technical Cooperation, INDRHI.
Rodriguez, Porfirio, Farmer, Toma 1-2, Sector Ponton, PRYN.
Roig, Raymundo, Executive Director, INDRHI.
Romano, Victor, Presidente, Villa Gonzalez, and Presidente, Junta de Regantes, PRYN.
Romero, Manuel, Farmer, Toma 1, Lateral I, YSURA.
Rosado, Luis, Manager, Junta de Regantes, YSURA.
Sanchez, Vinicio, Economist, Socio-Economic Section, PRYN-INDRHI, Santiago.
Sanchez, Humberto, Director, CIAZA, SEA, YSURA.
Santana, Ramon, Soils Section, OFWMP INDRHI, YSURA.
Sosa, Salmón, Encargado, Irrigation, OFWMP INDRHI, YSURA.
Sra. Luciano Farmworker, grandmother, dairy farmer, Navarrete, PRYN.
Steen, Dwight, Chief, ARD/O, USAID, Santo Domingo.
Toribio, Juan, President, Sector Navarrete, PRYN.
Velazquez, Leonardo, Sub-Director, INDRHI, Santo Domingo.

APPENDIX III

WORK SCHEDULE

WORK SCHEDULE

On-Farm Water Management Project Evaluation Team

January	
9-10	Visit to USU, Logan, Utah
14	Travel to the Dominican Republic Jan 14 to Jan 20 stay Hotel Cervantes, Santo Domingo
15	Internal Team Meetings
16	Meetings with USAID, INDRHI
17	Meetings with INDRHI
18	Visit to Santiago: Acto de Entrega de Laterales por El Presidente de la Republica; Review of Project Materials
19	Meetings with USAID, INDRHI
20	Team Meeting; Review of Project Materials
21	Travel to Azua, Jan 21 to Jan 25 stay Azua
21-25	Field Visits Azua: INDRHI, Junta de Regantes, Farmer interviews, SEA, AgroIndustria
26-27	Santo Domingo, Hotel Cervantes
28	Travel to Santiago
29-31	Jan 28-30 stay Hotel Don Diego, Santiago Field Visits Santiago: INDRHI, Farmer interviews, Meeting of Junta de Regantes, ISA
31	Travel to Jarabacoa Jan 31 stay Jarabacoa, Hotel Pinar Dorado
February	
1	Internal Team Meeting: Positive Findings, Problems, Recommendations Travel to Santo Domingo
1-9	Santo Domingo: Report writing Feb 1 to Feb 13 stay Hotel Cervantes
9	Delivery of 1st Draft of Report to USAID De-briefing with USAID Mission Director
12	Briefing for INDRHI Executive Director Meeting with USAID ARD to receive comments
13	Consultant Team to Depart Country
March	
7	Copy of Final Draft Report (English) delivered to Mission
21	Receipt of changes to Final Draft Report
April	
9	Delivery of Evaluation Report to Mission

APPENDIX IV

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APPENDIX V

ACRONYMS AND ABBREVIATIONS

APPENDIX V

ACRONYMS AND ABBREVIATIONS

AGWARM	Agricultural Water Management Project
asentamiento	Agrarian Reform settlement
BAGRICOLA	Banco Agricola
cabo de agua	Ditchtender
CADER	Centro de Administración del Desarrollo Rural
capacitación	Skills training
CDE	Corporación Dominicana de Electricidad
CIAZA	Centro de Investigaciones Agricola en Zonas Aridas
command area	Area served by an irrigation system
compuerta	Turnout, gate
conscientización	Educational process designed to make recipient aware of his/her condition
DDR	Departamento Distritos de Riego
DESFIL	Development Strategies for Fragile Lands Project
DR	Dominican Republic
EC	Electrical conductivity
finca	Farm
GODR	Government of the Dominican Republic
IAD	Instituto Agrario Dominicano
IPM	Integrated pest management
INDRHI	Instituto Nacional de Recursos Hidraulicos
Irrigation Association	A group of nucleos that takes water from the same lateral (or primary canal)
ISA	Instituto Superior de Agricultura (Santiago)
Juntas de Regantes	The highest level of water user organization; a grouping of Irrigation Associations
Junta Directiva	Board of Directors of the Junta de Regantes
LAB	Latin American Bureau (A.I.D.)
nucleo	Lowest-level organizational unit in the Junta de Regantes, usually consisting of farmers sharing a single turnout
O&M	Operation and maintenance
OFWMP	On-Farm Water Management Project
PACD	Project Assistance Completion Date
parcelero	Official Agrarian Reform beneficiary, recipient of use rights to a parcel of land
PD&S	Program Development and Support
pedacero	Provisional Agrarian Reform beneficiary with temporary use rights to a parcel — usually of substandard size
PROMAF	Proyecto Manejo de Aguas a Nivel de Finca (On-Farm Water Management Project)

PRYN	Proyecto de Riego, Yaque del Norte
RD$	Dominican Republic Pesos. At the time this report was written, February 1990, US$ 1.00 = RD$ 6.28
S&T	Science and Technology Bureau, A.I.D.
SEA	Secretaria del Estado de Agricultura (Ministry of Agriculture)
SINACAR	Sistema Nacional de Capacitacion de Asociaciones de Regantes
SINAPBRI	Sistema Nacional Autogestionario de Producción Bajo Riego
TA	Technical assistance
tail-end farmers	Farmers furthest from the initial point of entry of water
tarea	Measure of land, 0.063 hectares
toma	Turnout; point of irrigation delivery to farmer
USAID	United States Agency for International Development
USU	Utah State University
WUO	Water User Organization
YSURA	Yaque del Sur, Azua. Irrigation system serving Azua Valley